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AIMS

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SOME IMPLICATIONS OF LATER ROMAN CONSTRUCTION

WILLIAM MacDONALD

THE ROMANS ERECTED buildings side by side in two distinct manners. Their trabeated architecture, which was evolved chiefly from indigenous and Hellenistic Greek sources, is fundamentally different from their vaulted style, which was developed and perfected by Roman hands although some of its origins are to be sought in the pre-Roman Mediterranean world. The vaulted style is characterized by non-prismatic spaces, by the appearance of curves in both horizontal and vertical sections, and by walls and vaults constructed of smallish pieces of materials set in strong mortar. Columns were often used as working parts of these buildings, but they appear dissociated from their traditional orders, having been given new statical and visual functions. New types and combinations of vaults were developed, and the problem of the indirect transmission of thrusts was resolved. From those and other sources a new and spatially potent style evolved, an event of great significance and with many implications for the future of architecture.

A number of questions of the origin and interpretation of this late antique architecture provoked a ferocious scholarly argument which has lasted half a century, but in recent years the chief results of the controversy have been soberly and responsibly decanted,[1] providing the historian with a welcome and secure foundation for further study. In this later work stress has been laid on the identity and importance of the vaulted style, and since new techniques of construction helped to make the style possible, the suggestions that follow may assist in properly defining the nature and boundaries of Roman architecture.

Concrete. One possible objection to the use of the word "Roman" to describe the architecture that follows after the death of the emperor Maxentius in A.D. 312 is the change that occurs in the materials used in vaulted buildings. Roman concrete, as developed in the late Republican period and perfected in the first and second centuries A.D.,[2] seems to disappear abruptly from monumental architecture after the completion of Maxentius' Basilica Nova. It seems possible, however, to see in the construction of post-Maxentian vaulted buildings a further extension of the long history of Roman concrete. From a rough and unpretentious association of stone and mortar in early times the methods of building in concrete became by the second century A.D. a perfected technology, characterized by precise laying of aggregate, full knowledge of the properties of pozzolana, and the expert use of brick facing on both flat and curved surfaces.[3] By the early fourth century the use of brick and stone together in the facing (*opus mixtum* or *opus listatum*, probably both modern terms) becomes more common, and the wide mortar joints which then appear are reminiscent of the surfaces of concrete walls in the Republican period. In the great monuments of the sixth century the stone aggregate has disappeared almost completely, and the principal fabric of the buildings consists of only two components, brick and mortar.

During this long development the use of powerful mortar remains a constant, irrespective of the availablity of pozzolana.[4] What changes is the aggregate, and this is simply a change from pieces of stone to pieces of fired clay, to bricks. The great amounts of mortar employed in the cores of walls and the vaults of earlier imperial buildings continue to be used in the fifth and sixth centuries, and thus many of the later structures may reasonably be said to be made of concrete also. A comparison of the structure of the so-called "Temple of Mercury" at Baia, probably of the very late first century B.C. or the early first century A.D.,[5] with that of Hagia Sophia (largely 532–537) may be instructive (Figs. 1, 2, and 3). Fig. 1 is a section of the original masonry of the upper part of the Baia dome near the oculus, photographed when the vault was repaired about thirty years ago by Maiuri.[6] Figs. 2 and 3 are details of the fabric of Hagia Sophia, Fig. 2 of the west front and Fig. 3 of the extrados of the crown of the apse vault. In both buildings the technical process is much the same: in the laying-up the solid materials have been disposed in a roughly radial fashion in a very considerable volume of mortar. Given the capacity to make the necessary wooden form-work, this fairly simple technique of construction is common to many styles of architecture, but its fullest exploitation took place in the Roman imperial period when the manufacture and use of kiln-fired brick with mortar

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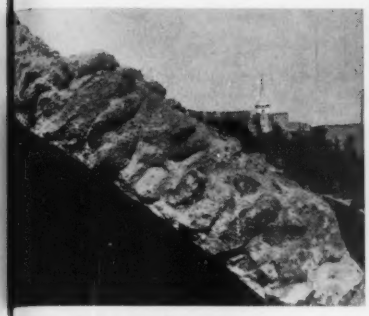
WILLIAM MACDONALD *presented this paper at the 1958 Annual Meeting of the Society in Washington.*



l. Baia. Section of the vault of the so-called ple of Mercury." (Maiuri)

FIG. 2. Constantinople. Hagia Sophia. Detail of west wall. (The Byzantine Institute)

FIG. 3. Constantinople. Hagia Sophia. Detail of the extrados of the apse vault at the crown. (The Byzantine Institute)

of lime and pozzolana reached astonishing proportions. From the time between the two examples cited many variations in the composition of the concrete have been preserved, but the general principles of construction remain the same. In the later period Roman brick supplants the stone aggregate, but the end result, the construction of walls and vaults in a kind of concrete, is the same in the sixth century as in earlier times. It is interesting that at Baia and Hagia Sophia the vaults are thinner than those of monumental buildings erected between the middle of the first century A.D. and the beginning of the fourth.

More knowledge of the economy of local building procedures within the empire might help to establish the reasons for the substitution of brick for various kinds of stone; at present it is possible to point to some examples lying between the chronological extremes of the Baia "Temple of Mercury" and Hagia Sophia. At the Circus of Maxentius (A.D. 309), beside the Via Appia just outside Rome, the great north wall gives evidence of the tendency to revert to earlier practices (Figs. 4 and 5).[7] This straight wall, 443.60 m. long, 0.90 m. thick and rising to 6.75 m. in height, has a core of concrete faced with alternating rows of brick and bread-loaf shaped blocks of local tufa. This work has been called an example of decadent later Roman construction,[8] but it stands today without buttresses or modern restoration and is essentially the same in structure as the wall of the Poikile at Hadrian's Villa.[9] At the Circus of Maxentius the facing is no longer executed in the crisp and precise manner of the first and second centuries, but has taken on the appearance, and indeed the actuality, of the substance of concrete (Fig. 5). In this sense it is directly related to the Baia vaults and to the brick and mortar fabrics of the sixth century. A similar example, dating from the time of Constantine, could recently be seen in Constantinople along the northwest side of the site of the Byzantine Hippodrome, where a series of piers was uncovered.[10] One of these is shown here (Fig. 6): the mortar joints are slightly thicker than the bricks. And this characteristic also appears in the late Roman fabric of San Lorenzo in Milan, built sometime between the middle of the fourth century

FIG. 4. Rome. Circus of Maxentius. The north wall. (Author)

FIG. 5. Rome. Circus of Maxentius. Detail of the north wall. (Author)

and the middle of the fifth, where, in at least part of the structure, the bricks account for less of the total mass than the mortar.[11]

What is the significance of this? Simply that one fundamental material used in Roman construction, the composition of which varied somewhat through the centuries, continued to be used in post-Constantinian times. Whatever credit may be given to eastern influences in the formation of sixth-century architecture, it remains to be shown that vaulting in the time of Justinian is not of earlier Roman inspiration insofar as its general technical composition is concerned. The light dome of San Vitale in Ravenna, made of tubular terra-cotta vases,[12] is not an exception to this but rather the logical culmination of the earlier and very widespread use of vases and pots to lighten Roman concrete vaulting,[13] a development which may have been related to the search for light aggregates such as the pumice found in the dome of the Pantheon or the volcanic scoriae which appear in several Syrian vaults built during Roman times.[14] None of this, however, answers the question of the reason for the substitution of brick for stone aggregate. Perhaps brick spread out through the vault fabrics, so to speak, from the rib-like arcs of brick that were incorporated in so many Roman buildings, or perhaps the developed Roman forms were simply adapted by the later building economy about which so little is known. The brick vaults certainly required less wooden form-work. At all events there was a well-developed tradition of vaulted construction in brick in Asia Minor and Constantinople before the age of Justinian.[15]

FIG. 6. Constantinople. The Hippodrome. One of the piers of the northwest side. (Author)

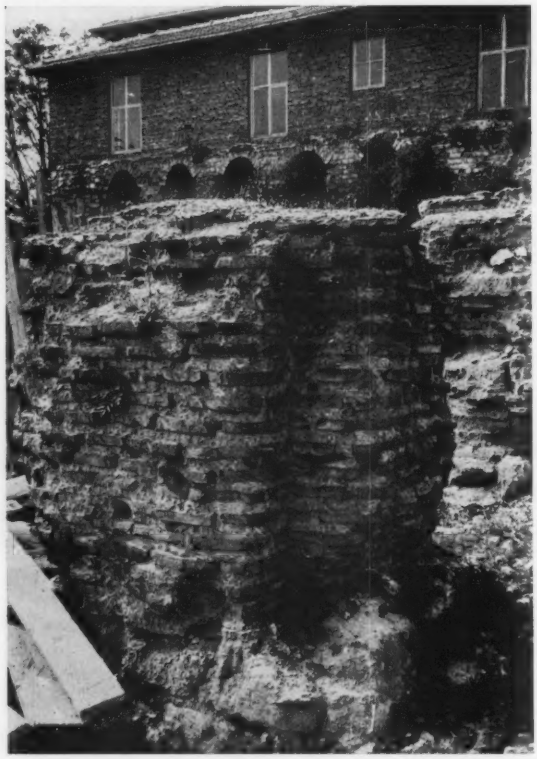


FIG. 7. Rome. Pantheon. View from the dome of Sant'Ivo. (Author)

Construction. The state of knowledge of later Roman construction is reflected in modern writing on the Pantheon. Piranesi's fanciful dome ribs of brick still enjoy a fairly wide acceptance, and one may easily find erroneous descriptions of the materials used in the building.[16] There are unsolved problems concerning the structure of the Pantheon, but it is certain that there are no ribs in the dome, and the nature of the rest of the fabric is known. The importance of the design has never been in question, but the ingenuity and intricacy of the structural system of the building, so important for the future of architecture, has received little attention outside of Italy.[17] The not uncommon concept of the Pantheon as a very thick cylindrical wall of brick-faced concrete topped by a monolithic "pot lid" of concrete cannot be said to be accurate; the designer of the building sought a much more subtle structural solution than that idea implies. In both aesthetics and technology the building departed almost radically from previous concepts, and in spite of its apparently simple forms (Fig. 7), the origins of the Pantheon are not easy to name; probably they should be sought at Baia, in the Forum and Market of Trajan, and in the Neronian and Flavian palaces on and near the Palatine.[18]

From the locked rings of brick which define the oculus and perform the statical functions of a lantern, to the immense annular foundations of fine concrete, the Pantheon is a highly original building conceived by a most creative architect.[19] It divides naturally into three structural zones: the dome above the top exterior cornice, the middle section of the building down to the lower interior cornice, and the

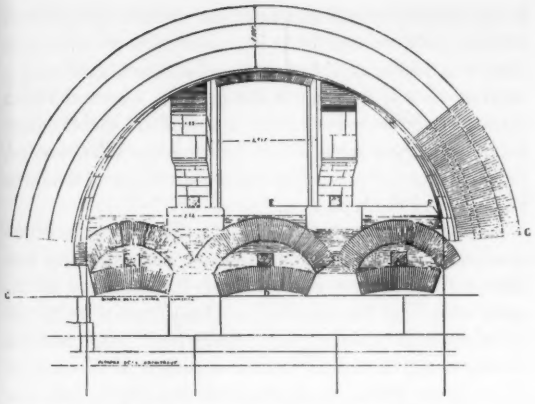


FIG. 8. Rome. Pantheon. Structural system of the attic zone. (Beltrami)

remaining lower portion. The dome above the exterior cornice is of concrete without brick facing, containing an aggregate of tufa and pumice in the upper two-thirds of the zone and of tufa and broken brick below.[20] The exterior "steps" solved the problem of providing falsework for the steeper part of the extrados: above the last or seventh step the pour could have been made without exterior shuttering. Also, during and after the drying-out of the concrete the ring-steps would counterweight some of the thrusts of the dome, for the great size of the building and the complexities of its construction make it unlikely that it is a monolithic structure free from thrusts.[21] The nature of the interior wooden form-work that was used can only be surmised; in the "Temple of Mercury" at Baia there is fairly good evidence of the use of full centering,[22] and it seems reasonably certain that the Pantheon, with somewhat more than four times the surface and eight times the volume of the Baia building, required a full forest of scaffolding and form-work.

The weight and probably the thrusts of the superstructure are transmitted to the ground through an elaborate system of semi-circular and segmental brick arches in the middle zone. Behind the interior attic course (Fig. 8) and the two lowest rings of coffers this system statically relates the dome to the lower parts of the building. The one hundred and twenty-eight brick arches, some of the larger of which are really barrel vaults, are disposed radially from the center of the building both in plane and on axis, and they distribute the pressures from above to the columns and wall below.[23] Far from being a simple cylinder of concrete, the bottom or third zone is a form of sinuous wall, weaving around the external and internal niches and in effect including sixteen radial piers formed by the full thickness (6.05 m.) of the wall between the niches.

Thus the Pantheon can be said to possess an organic quality, a quality which was the product of a very considerable knowledge of engineering and probably also of a careful study of certain forms in nature. Within its fabric important structural methods are applied on a very large scale. The embedded brick arch is extensively used, and the internal columns are related to the outer wall by arches set along radial planes; both of these devices are of importance in later Roman architecture.[24]

FIG. 9. Villa of the Quintilii. Arch embedded in a wall of concrete. (Author)

Embedded brick arches take two forms, one in walls and one in vaults; their functions have been variously interpreted. The wall arch has often been said to discharge pressures from above,[25] but in simple concrete walls where the action of the mortar bonds all the fabric together this seems unlikely. In many cases these constructions barely fit the definition of the word "arch" because of their considerable irregularities. The illustration shown, from the so-called "Villa of the Quintilii" just southeast of Rome, is an example of this common condition (Fig. 9).[26] The vault arch or rib has also been held to be structurally important, but once again most if not all of the known examples would be poor structural risks because of their very light and sketchy character.[27] It seems probable that Middleton was right when he suggested almost seventy years ago that these arches were of use only during the construction of the building.[28]

Between the completion of the Pantheon about 126 or 127 and the advent of monumental Christian architecture we can follow the development of Roman vaulted construction chiefly in the baths and in the pavilions and halls of the great villas.[29] The concrete-vaulted bath buildings were the forerunners of the immense and massive Basilica Nova in Rome (largely 307–312), which marks the end of one line of development in Roman architecture, probably in part because it reached the very limits of construction in plain concrete. The evidence from the villas and pleasure gardens is by no means complete, but in these buildings of smaller scale there can be seen examples of that lightness and ingenuity of construction which will identify the later brick-vaulted architecture. At Hadrian's Villa, for example, vases appear in the half-dome over the sun-bathing room

or Heliocaminus; a bit of brick vaulting can be seen at the Large Baths; and one room of the Small Baths is so ingeniously vaulted, partly by convex surfaces, that its roof has been called a "static paradox."[30] The famous vestibule of the Golden Square is probably the best-known of the melon or gored vaults at the Villa; such vaults imply intricate and elaborate form-work. At the suburban Roman villa called "Le Vignacce" (mid-second century) there is ample evidence of light vaulting with vases,[31] as there is at the nearby Villa of the Gordians (about 240). Also at the Villa of the Gordians are the remains of a beautiful gored oval dome, as well as an annular vault penetrated by ramping vaults disposed radially.[32] The large round domed chamber above this annular vault was lit by circular windows penetrating the mass of the vault above its springing line, and at the so-called "Temple of Minerva Medica" in Rome (early fourth century) the upper supporting walls of a domed decagon are opened up into large windows.[33]

It seems not unreasonable to think that these buildings, from the point of view of their structural solutions, are steps in a general development that leads toward the sixth-century style. In the fourth and fifth centuries there were further innovations, and these were combined, in buildings designed for Christian use, with the methods perfected in the past.

Structures of two concentric walls. The next important type of vaulted building to be fully defined within the Roman empire was one of two concentric walls. In this kind of centralized structure the inner envelope or wall is the higher, and the outer, lower wall is connected to the inner by a vault which is usually of roughly annular shape. In all of these structures the form of the lower part of the inner cylinder or polygon is defined simply by piers or columns, so that the space of the outer ring is, on the lower level or levels, continuous with and radiating from the central volume. There are many variations on this basic type, and the number of examples standing is very large.[34] Most of the western mediaeval buildings of this kind were inspired, however indirectly, by the Holy Sepulchre in Jerusalem, but that building is antedated by other examples, both eastern and western.[35] The origins of the basic scheme are by no means certain, and the question has been much debated, particularly in terms of iconography and function.[36] The structural evolution is clearer, however: most of the components and solutions existed in Roman architecture before the fourth century.

Very early in the development of concrete vaulted architecture, upon the rebuilding of Praeneste early in the first century B.C. by Sulla, a prototype of the concentric plan appeared. On the next to the highest level of the great axial complex that forms the sanctuary of Dea Fortuna there are two symmetrically placed exedrae, each of which in plan forms half of the basic kind of plan under discussion.[37] In each of the exedrae an inner semicircular colonnade is surrounded by half of an annular vaulted and coffered corridor, whose longer side is a solid surface and whose shorter is identical with the row of columns. Although a curving vertical wall above the columns terminates in a cornice at about the level of the crown of the annular vault behind, and the inner semicircular space was left unroofed, there is in these forms a direct statement of one of the basic principles of the later type.

Another prefiguration appears in the Pantheon, in the structural relationship of the interior niche columns and their entablatures to the corresponding sections of the outer wall. This use in centralized buildings of arches set out along radii and spanning from inner to outer verticals concentrically arranged is also an essential element of the two-shell scheme. Something like this can be seen also in the structural dispositions around the octagonal room of the Domus Aurea, one of the very first monuments of the new vaulted architecture in brick and concrete (A. D. 65–68).[38] There the semicircular arches are embedded in walls which are obliquely rather than radially arranged, and they are placed over lintels which are flat brick arches. But the creation of a nearly complete exterior ambulatory, cut through a dozen walls which abut on to and help support the central octagonal vault, is an early example of the general type of building under discussion.

Other parts of the two-shell building were derived from tholoi, from centralized buildings with niches radially set out, and from the arcade motive so common throughout Roman architecture. The full characterization of the type was accomplished in the fourth century in such buildings as Santa Costanza in Rome and the Holy Sepulchre in Jerusalem. In all examples the thrusts from the central vault to the ground are in part transmitted indirectly, travelling along an inclined or conical route, giving the buildings that stable structural system proclaimed by their silhouettes. When no drum is used the outer ring is directly related statically to the dome, and the ambulatory vault or vaults become a continuous buttress; Saints Sergius and Bacchus in Constantinople is an example of this type (Fig. 10).[39] In all of these buildings the new solutions of the distribution of vault thrusts in depth produced space-shapes hitherto unknown in architecture, and made possible new and influential developments in lighting, scale and decoration. The insertions of colonnaded exedrae between the central piers became common, and combinations of centralized and longitudinal forms were tried, but in each case the inner, symbolic vault pushes up above the outer ring, bringing light into the central void.[40]

Executed in brick and mortar and decorated with cornices and string courses of brick, the sixth-century structures of this class that have been preserved are of course the antithesis of trabeated architecture. Their exteriors have sometimes been dismissed as unimportant and unaesthetic, but the outside of this kind of building reflects

its inner structural system and so suggests a new standard of design. The east end of the church of San Vitale in Ravenna, for example (Fig. 11), is a cascade of geometric forms from the tiled octagonal roof over the dome down to the lowest subsidiary chapel; these forms announce the structural logic and method of the building, and can properly be said to identify a new architecture.

Summary. Certain Roman techniques of construction continued in use after the collapse of the empire in the west, and were incorporated in many of the vaulted buildings of the sixth century. In the continuum of Mediterranean architecture vaulting was, if not always a commonplace, a widely known method of roofing, but it was the Romans who developed and perfected a technology for this tradition. They cannot be credited with the invention of vaulting itself, as understood in a general sense, but by exploring the subject and applying to it their particular talents they made it into something it had not been before. Many examples of the design and construction of Roman vaults have survived, chiefly in some form or other of what can quite properly be called concrete, and the form of these vaults and the spaces they shape have changed the history of architecture.

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FIG. 10. Constantinople. Saints Sergius and Bacchus. Interior view. (Powell)

FIG. 11. Ravenna. San Vitale. East end. (Author)

1. By A. Boëthius, "Roman Architecture from its Classicistic to its Late Imperial Phase," *Göteborgs Högskolas Årsskrift*, 47, fasc. 8 (1941); J. B. Ward Perkins, "The Italian Element in Late Roman and Early Medieval Architecture," *Proceedings of the British Academy*, 33 (1947), 163–194; F. E. Brown, "Roman Architecture," *College Art Journal*, 17 (1958), 105–114. For the history of the controversy, which includes both architecture and the figural arts, see O. J. Brendel, "Prolegomena to a Book on Roman Art," *Memoirs of the American Academy in Rome*, 21 (1953), 7–73. The argument about the origins of later Roman and early mediaeval architecture has by no means died down; see for example E. H. Swift, *Roman Sources of Christian Art* (New York, 1951), together with important reviews in the *Journal of Roman Studies*, 44 (1954), 143–148, and the *Art Bulletin*, 36 (1954), 69–74.

2. For Roman concrete, see M. E. Blake, *Ancient Roman Construction in Italy from the Prehistoric Period to Augustus* (Washington, 1947), pp. 324–352 and bibliography; G. Lugli, *La tecnica edilizia romana* (Rome, 1957), I, 361–442.

3. E. B. Van Deman's "Methods of Determining the Date of Roman Concrete Construction," *American Journal of Archaeology*, 16 (1912), 230–251 and 387–432, is a study of the development of the composition of concrete. For pozzolana, see A. Maffei, "Pozzolana," *Enciclopedia Italiana* (1935/1949 ed.). An example of a surface of double curvature built in brick can be seen in the Terme dell'Invidioso at Ostia, illustrated in Lugli, *op. cit.*, Vol. II, Plate CXCIX. 5.

4. The use of pozzolana seems to have been limited to central Italy, and it is difficult to believe in its indispensibility in later Roman vaulted buildings because of the preservation and stability of so many provincial examples.

5. Most of the techniques developed for dating the structure of concrete monuments are based upon the evidence of buildings and materials found in and near Rome, and these techniques cannot with any confidence be applied much beyond the suburban limits. The Baia structures were built after the time of Sulla, but there is no certainty about their date.

6. A. Maiuri, "Il restauro di una sala termale a Baia," *Bolletino d'Arte*, 10 (1930), 241–253.

7. This is the best preserved of all Roman circuses and has been inexplicably neglected since its name and date were established by A. Nibby, *Roma nell'anno MDCCCXXXVIII* (Rome, 1838), I, 632–644. A survey and study of the building has been made by the present writer.

8. By A. Nibby, *Del circo volgarmente detto di Caracalla* (Rome, 1825), p. 6; a similar opinion was apparently held by Van Deman, *op. cit.* (note 3, above), pp. 430–431, for whom thin mortar joints and carefully and regularly laid aggregate were the chief criteria of "good" concrete.

9. H. Kähler, *Hadrian und seine Villa bei Tivoli* (Berlin, 1950), p. 22. Facings partly of trimmed blocks of tufa can be found at Pompeii, Ostia, and Hadrian's Villa.

10. A. M. Schneider, "Grabung im Bereich des Euphemia-Martyriums zu Konstantinopel," *Archäologischer Anzeiger*, (1943), pp. 225–259; R. Duyuran, "First Report on Excavations on the Site of the New Palace of Justice at Istanbul," *İstanbul Arkeoloji Müzeleri Yilliği*, 5 (1952), 21–38.

11. A. Calderini, G. Chierici, and C. Cecchelli, *La Basilica di S. Lorenzo Maggiore in Milano* (Milan, 1951), pp. 91–92 and Plate XXXII.

12. For this interesting vault see R. Bartoccini, "Restauri in San Vitale in Ravenna," *Felix Ravenna*, (1931), pp. 77–101 and (1932), pp. 135–165; L. Crema, "L'architettura di San Vitale," *Arte cristiana*, (1947), pp. 47–50.

13. There is considerable literature on this interesting subject which can be approached through P. Verzone, "Le cupole di tubi fittili nel V e VI secoli in Italia," *Atti del I° congresso nazionale di storia dell'architettura*, 1936 (Florence, 1938), pp. 7–11; G. de Angelis d'Ossat, "La forma e la costruzione delle cupole nell'architettura romana," *Atti del III° convegno nazionale di storia dell'architettura, Rome, 1938* (Rome, 1940), pp. 246–247; L. Crema, "Origine e impiego di fittili cavi nell'architettura romana," *Bolletino del centro di studi di storia dell'architettura*, 6 (1952), 6–8; Lugli, *op. cit.* (note 2, above), I, 689–690. On the possible western origins of San Vitale, see Ward Perkins, *op. cit.* (note 1, above), pp. 10–14.

14. For the basic literature on the Pantheon, see note 19, below; for the scoriae, H. C. Butler, *Early Churches in Syria. Fourth to Seventh Centuries* (Princeton, 1929), p. 18.

15. The Hippodrome at Constantinople is an example. It was begun by Septimius Severus in the early third century and largely completed by Constantine about 330. See S. Casson, D. T. Rice, and others, *Preliminary* and *Second Report Upon the Excavations Carried out in the Hippodrome of Constantinople* (London, 1928 and 1929). Some of the techniques of brick vaulting in the east were unknown in the Roman west; J. B. Ward Perkins, "The Aqueduct of Aspendos," *Papers of the British School at Rome*, 23 (1955), 123. In the Near East there is a tradition of building vaults without any centering; see N. Eton, *The Turkish Empire* (London, 1799), p. 226; also A. Smith, *Blind White Fish in Persia* (London, 1953), where Fig. 11 shows such a vault under construction (I owe this second reference to Mr. Ward Perkins).

16. For example in T. Hamlin, *Architecture through the Ages* (revised ed.; New York, 1953), p. 149, or in the *Oxford History of Technology* (Oxford, 1956), II, 413.

17. On this general problem see the *Journal of Roman Studies*, 44 (1954), 147–148.

18. To seek the origins of centralized buildings in the prehistoric past seems gratuitous.

19. The fundamental works on the Pantheon are L. Beltrami, *Il Pantheon* (Milan, 1898); A. M. Colini and I. Gismondi, "Contributi allo studio del Pantheon. La parete frontale dell'avancorpo e la data del portico," *Bulletino della commissione archeologica communale di Roma*, 54 (1926), 67–92; A. Terenzio, "La restauration du Panthéon de Rome," *Mouseion*, 6 (1932), 52–57; *idem*, "Pantheon," *Enciclopedia Italiana*, 26 (1935/1949), 212–214; J. Guey, "Devrait-on-dire: Le Panthéon de Septime-Sévère?," *Mélanges d'archéologie et d'histoire de l'école française de Rome*, (1936), pp. 198–249; H. Bloch, *I bolli laterizi e la storia edilizia romana* (Rome, 1947), pp. 14–19 and pp. 102–117; R. Vighi, *The Pantheon*, trans. G. (*sic*) B. Ward Perkins (Rome, 1957).

20. A. Terenzio, "Pantheon," p. 213; Vighi, *op. cit.*, p. 50

21. The question has not been resolved. A statical analysis (force polygon system) prepared by Milani and published by Vighi, *op. cit.*, p. 56, would seem to argue against the monolithic concept. Compare Terenzio, "La restauration," 55.

22. A. Maiuri, *op. cit.* (note 6, above), pp. 251–252.

23. See R. Biolchi's analytical axonometric drawing in Vighi, *op. cit.*, p. 52 (also published in Kähler, *op. cit.* [note 9, above], p. 92).

24. G. Lugli, "Nuove forme dell'architettura romana nell'età dei Flavi," *Atti del III° convegno nazionale di storia dell'architettura, Rome, 1938* (Rome, 1940), pp. 95–96; G. de Angelis d'Ossat, *op. cit.* (note 13, above), pp. 247–250.

25. This is a common statement, as in W. J. Anderson *et al.*, *The Architecture of Ancient Rome* (London, 1927), p. 40, or G. Giovannoni, "Building and Engineering," in *The Legacy of Rome*, ed. C. Bailey (Oxford, 1951), pp. 442–445; compare, however, the *Journal of Roman Studies*, 44 (1954), 146–147. E. H. Swift, *op. cit.* (note 1, above), p. 101, says that some Roman construction was reinforced by brick ribs.

26. This arch appears on the southeast side of building no. 14 according to the numbering of T. Ashby, "La Villa dei Quintilii," *Ausonia*, 4, fasc. 1, (1909), 77–80 and Plate III.

27. See for example the illustrations in Lugli, *La tecnica* (note 1, above), Vol. II, Plate CCV.

28. J. H. Middleton, *The Remains of Ancient Rome* (London, 1892), II, 132.

29. Few of these important villas have been properly studied, other than that called Sette Bassi; N. Lupu, "La Villa di Sette Bassi sulla Via Latina," *Ephemeris Dacoromana*, 7 (1937), 117–188.

30. S. Aurigemma, *Villa Adriana* (*Hadrian's Villa*) *Near Tivoli* (Tivoli, 1953), p. 22.

31. T. Ashby, "Classical Topography of the Roman Campagna.—III. (The Via Latina).—Section I," *Papers of the British School at Rome*, IV (1907), 74–76; G. Lugli, "La villa dei Flavi Cristiani 'ad duas lauros'," *Atti della Pontificia Academia romana di archeologia, Memorie*, 2 (1928) 183–192.

32. The annular vault is illustrated in G. T. Rivoira, *Roman Architecture*, trans. G. McN. Rushforth (Oxford, 1925), p. 180.

33. G. Giovannoni, "Il ninfeo della Villa Liciniana e le cupole romane," *Annali della società degl'ingegneri e degli architetti Italiani*, (1904), 165–201; *idem*, *La cupola del cosidetto Tempio di Minerva Medica* (Rome, 1943); G. Caraffa, *La cupola della sala decagonale degli Horti Linciani restauri 1942* (Rome, 1944).

34. Many baptistries and funerary monuments take this form. In Rome the outstanding examples are the Lateran Baptistry, Santa Costanza, and San Stefano Rotondo.

35. See K. J. Conant, "The Original Buildings at the Holy Sepulchre in Jerusalem," *Speculum*, 31 (1956), 1–48, for the late fourth century date for the Rotonda of the Anastasis.

36. The major points are discussed by A. Grabar, *Martyrium*, (2 vols.; Paris, 1946); see also K. Lehman, "The Dome of Heaven," *Art Bulletin*, 27 (1945), 1–27.

37. F. Fasolo, "Il Tempio della Dea Fortuna Prenestina," *Spazio*, 1 (1950) 17–28; or *idem*, *Il santuario della Fortuna Primigenia a Palestrina* (Rome, 1952).

38. See the plan and axonometric drawing in Kähler, *op. cit.* (note 9, above), pp. 100–101.

39. J. Ebersolt and A. Thiers, *Les églises de Constantinople* (Paris, 1913), Plates VIII-X.

40. Here also is the beginning of the Byzantine four-column church, which can be thought of as a variant of the two-envelope scheme.

DRAWINGS FROM A THIRTEENTH-CENTURY ARCHITECT'S SHOP: THE REIMS PALIMPSEST

ROBERT BRANNER

THE METHODS employed by the Gothic architect to design and construct an edifice have long been a subject of intense inquiry. One of the chief modes of investigation has consisted in analyzing the documents left by the architect himself, in the effort to determine what he intended to do and how he went about it. A small number of texts is available, starting with the late fourteenth century [1] and extending, with considerable gaps, into the sixteenth.[2] Prior to the 1380's, however, only a few graphic documents, generally of more limited scope than the texts, have survived—manuscripts in the tradition-proud lodges, or plans engraved on the walls of monuments. None seems to date from before about 1220–1230 and many are almost unintelligible to modern eyes. Foremost among the unfinished tasks of modern research is the publication of such early documents, of which the Reims palimpsest is an outstanding example.

The presence of drawings in the thirteenth-century obituary of the Cathedral Chapter of Reims [3] was first reported to the general public by P. Varin, archivist at Rennes, in 1838.[4] Varin had already sent the manuscript to Didron and Lassus, two of the foremost students of Gothic architecture at the time. Lassus began to copy the effaced designs, while Didron endeavored to obtain funds for their publication. Neither was completely successful. In 1846 Didron finally published in his *Annales archéologiques* [5] two drawings and fragments of a third which Lassus had been able to decipher, and a year later another page was submitted to the public in an article on the engraved plans from the roof of Limoges Cathedral.[6] The manuscript lay dormant for nearly a hundred years, until Hans R. Hahnloser restudied it in connection with his edition of the Villard de Honnecourt manual and published an accurate version of the page on which Lassus had been able to discern only fragments.[7] Up to the present, however, accurate renderings of the complete series of drawings are unavailable, and this article seeks to fill the gap until the appearance of Hahnloser's definitive study.[8]

Manuscript G 661 consists of 153 parchment leaves containing a martyrology and obituary of the metropolitan chapter of Reims (ff. 1-126r), of which all but a few entries are in one hand, and a collection of copies of acts, litanies and ceremonials (ff. 128r-149r), in a different but probably contemporary hand.[9] The parchment was given by a certain Alanus de Rosceio, canon of the cathedral, who is otherwise unknown except for the meager information furnished in the obituary under 20 April.[10] The text cannot have been written before June, 1263, when Canon Hugh de Lagery, whose name was entered by the original scribe of the obituary, was still alive; [11] but it must have been completed before August, 1270, date of the death of Archbishop Jean de Courtenay, whose name was entered by another scribe.[12]

Alanus de Rosceio gave enough parchment for the entire 153 leaves of the manuscript and seems not to have cared where the skins came from or what service they had already seen. The hair sides of ff. 85-96, 99-106, 111 and 112 bear the palimpsested drawings,[13] and the various "blank" leaves, between the obituary and the acts as well as at the very end of the manuscript, contain the remains of an effaced text written in a contemporary cursive hand.[14] The presence of the cursive on f. 126v, the last folio of the obituary, indicates that in all probability the last twenty-six leaves were prepared for the manuscript in the parchment shop at the same time as the larger first section.[15]

The parchment is rather heavy and rough, and there is no difference in texture or refinement between the palimpsested leaves and the clear ones. When they entered the parchment shop, the skins were washed, stretched [16] and cut into sections to form a prepared pile of quires.[17] The quires were ruled in twenty-six lines with vertical margins, for which the pinpricks in most cases are still preserved.[18] The skins seem to have been processed in a methodical manner, as is shown by the positions of the palimpsested designs in the quires.

Three regular quires of twelve leaves each, placed hair-to-hair and flesh-to-flesh, contain the drawings which occur alternately on the recti and versi of the present numbers

ROBERT BRANNER *presented this paper at the 1958 Annual Meeting of the Society in Washington.*

(Fig. 1). The drawings are continuous on both halves of each folio (with the exception of the counterparts of ff. 112v and possibly 111r),[19] and each such group formed part of another folio in the same quire, as is obvious from the manner in which the drawings can be seen to continue from one leaf to the next. Thus ff. 89r-92v formed the top half of ff. 90v-91r, 101r-104v that of 102v-103r, and so on (Fig. 2). Each folio is inverted with respect to its complementary half. The leaves measure at present about 32.5 cm. by 22.5 cm. and seem to have been slightly trimmed at the last binding.[20] Before cutting, the sheets must therefore have been at least 66 cm. by 45 cm., including the small strips lost in trimming.

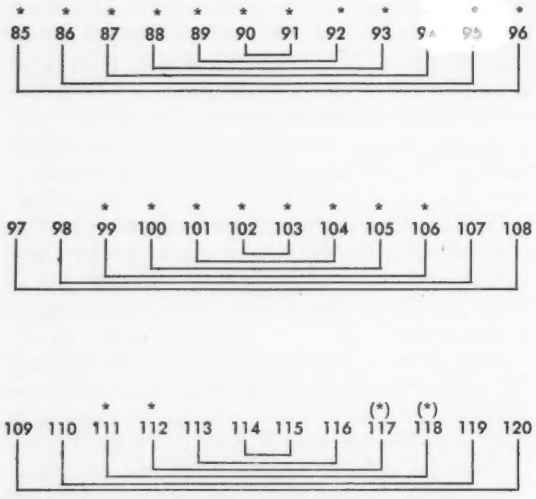


FIG. 1. Diagram of Reims MS G 661. Quires containing palimpsested drawings are marked with an asterisk (*). (Author)

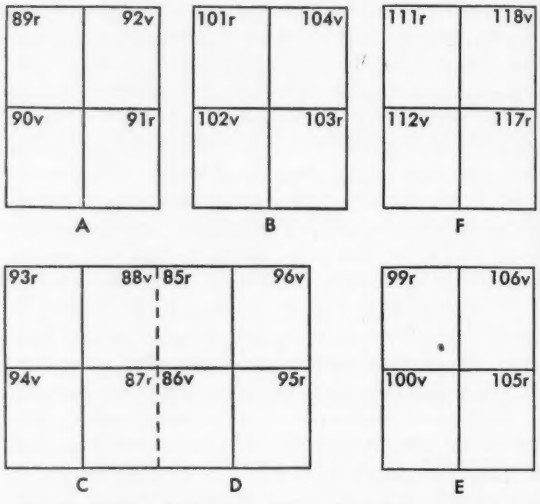


FIG. 2. Diagram of Reims MS G 661 to show original sheets of drawings reassembled. (Author)

Certain difficulties arise in the attempt to determine the precise size of the original sheets. The pattern of ruled, parallel lines on sheet C (Fig. 2), for instance, is virtually identical with those on D, and it is likely that both C and D were formerly part of the same skin.[21] The original sheet could then have measured at least 65 cm. by 98 cm. Such a size is not out of keeping with the skins used in the thirteenth-century architectural shop.[22] The incomplete drawings in E indicate that it also has been reduced, although it is practically impossible to determine whether more than a few centimeters have been removed from the edges.[23]

The present state of the drawings leaves much to be desired, with respect both to the original format and to the designs themselves. On A, B, C and D, the drawings were not completely effaced and portions are still visible to the naked eye.[24] But there are indications on D and E that the skins had been used several times prior to their incorporation into the manuscript. E contains two levels below the present text, and D at least three.[25] Each successive drawing seems to have been washed off before the next one was made, so that the ink of the lowest levels is almost entirely gone and only an occasional impression of the drawing instrument remains to guide us. Irregular scratches on the surface often add to the difficulty of reading the design, and the response of these folios to modern photographic techniques is not always satisfactory.[26] The various stages of E can still be discerned, thanks to an inefficient washing in the parchment shop. Not only can the two levels be decisively isolated (E-1, lower; E-2, upper), but the preliminary lines of E-2 can be separated from the final drawing. D, on the other hand, is much more complex, since the axes of the lowest level were used again for another drawing, and the lines of one level frequently coincide with those of the other. If D were originally a part of the same sheet as C, then possibly the close grid of parallels represents the oldest level (D-1); the remaining levels (D-2, D-3) would then have been put on after the sheet, C-D, had been cut in two and one section used in an assemblage of skins, glued or sewn together to provide a larger surface for drawing than could a single sheet. The Strasbourg parchments furnish us with intact examples of how such assemblages were made in the thirteenth century.[27] The hypothesis of assemblage at Reims may be confirmed by the obviously fragmentary nature of the upper levels on D and by the relatively larger scale of the designs, with reference to those on C and A or B. Such a first assemblage may

have been used again when a third drawing was made, or perhaps the various sheets were separated at this time and reassembled in a different manner. It is conceivable that E and F were in some way part of these large designs.

Sheet A (Fig. 3) contains the elevation of a three-bay façade.[28] The drawing has not been completed, although the lower portion and the left half have been sufficiently finished to give a fairly clear general picture. Four buttresses divide the façade into three bays, each of which contains a portal at ground level.[29] The central portal is masked by what can only be considered a screen, consisting of a pierced tympanum and three arches supported by isolated columns. The left arch is trefled and perhaps the central arch was to have been the same.[30] The tympanum is pierced by two kinds of quatrefoils. Three small canopies, of the kind to surmount statues, with gables and trilobes, can be seen through the arch, on the left embrasure of the portal. The gable over the central portal has a sculpted finial and a border of cusps with floral terminations and pierced spandrels.[31] The smaller gable over the left portal is similar but less ornate. There is no evidence for a screen across this portal, although the engaged colonnettes on the lateral faces of the opening suggest a decorative arch was to have been placed here. Details such as capitals and bases have also not been drawn in, and only a few mouldings, on the left portal, are finished.

At ground level, the buttresses are faced with twin blind arcades, each with a trefled arch and a gable. At the level of the main gable there is a similar but shorter story, in turn surmounted by small aediculae with polygonal spires. Only three arches are shown on the aediculae, but the repetition of the small gables at the edges, in side-view, indicates the presence of two more. The aediculae thus form 5/8 octagons and are most likely open, while the platforms and buttresses below must project forward to support them. The buttresses may well be pointed, a feature that would explain why the gables and trefles, like the lateral ones on the aediculae, are asymmetrical.[32]

The upper part of the design is less satisfactory. Three cornices, the lowest at the apex of the main gable, divide the façade horizontally. Although the parallel lines designating the cornice mouldings are prolonged across the entire façade, it seems clear that only the lowest cornice, above the band of sculpted crockets, is to extend the full distance. The upper two probably stop at the central bay, which was to be filled by a large window. Here, only the smallish rose has been drawn in, and it intersects what one would otherwise assume to be part of the topmost cornice of the structure. The heights of both stories limited by the identifiable cornices are nearly equal, and slight setbacks at each level are indicated on the lateral buttresses at the left edge of the drawing. How the faces of these stories were to be completed is not indicated, however, and Lassus' twin arcades do not seem to have any basis in the manuscript. Only the blind arch on the face of the adjacent buttress can be discerned in the drawing.

The upper section of the drawing is unfortunately too incomplete to permit even the simplest conclusions to be drawn. A single arc rises above the topmost cornice in the left bay and is traversed by a diagonal line. The arc starts too far to the right of the left buttress, and arrives too far to the right of the inner buttress, to form the arch of a flying buttress. It may, of course, merely be a tentative line that was to be corrected later. The absence of a flying buttress in the finished design would in all probability indicate a two-towered façade, for which there is actually no evidence.

Sheet B (Fig. 4) contains the elevation of another three-bay façade, at a smaller scale than A and definitely without towers.[33] As with A, the design is most complete at the bottom and left-hand side, although the whole is more finished and detailed; capitals and bases, for instance, are indicated. The base-line is preserved on f. 102v and above it are a plinth moulding, a dado crowned by a string-course and an area for *piedroits*. The embrasures of the central portal each bear four gabled canopies similar to those on A, but with imposts, capitals and colonnettes on axis beneath; the embrasures of the lateral portal have two canopies each. Archivolts surmount the portals and are framed by gables that form a continuous zigzag across the façade. At the left and right edges, lateral buttresses with *glacis* and setbacks are shown. The buttresses separating the portals are ornamented by blind arcades under a framing arch, representing a clear break with the decoration on the embrasures. At the level of the gables, the buttresses carry small, square aediculae on columns, with fish-scale roofs and small architectural lanterns. These aediculae must stand on platforms jutting out between the gables and must be open, like those on A.

Above the zone of the gables, the side bay is formed by a series of blind arcades. Twin arcades under a framing arch occupy the face of each buttress, and the bay between has two similar units flanked by single arches with extra mouldings. The latter is repeated on the side of the lateral buttress, suggesting a continuous design, and may well be intended for the sides of the façade buttresses, which would indicate the degree of their projection at this level. In the central bay, a large window with two twin-lancet-and-quatrefoil motifs rises to a rather small rose, the whole framed by a deep arch. The side bays stop at the cornice above the blind arcades; above this, the outer buttress is formed by a large cross-shaped aedicula which rests in part on the lateral buttress and which supports a smaller lantern-like towerlet with two arches and a short spire. The inner buttress has two similar but simpler structures of the same height.[34] From the cornice to the hip of the vault, indicated by the great arch in the central bay, rises the arch of a flying buttress, with a cusped intrados and a moulded

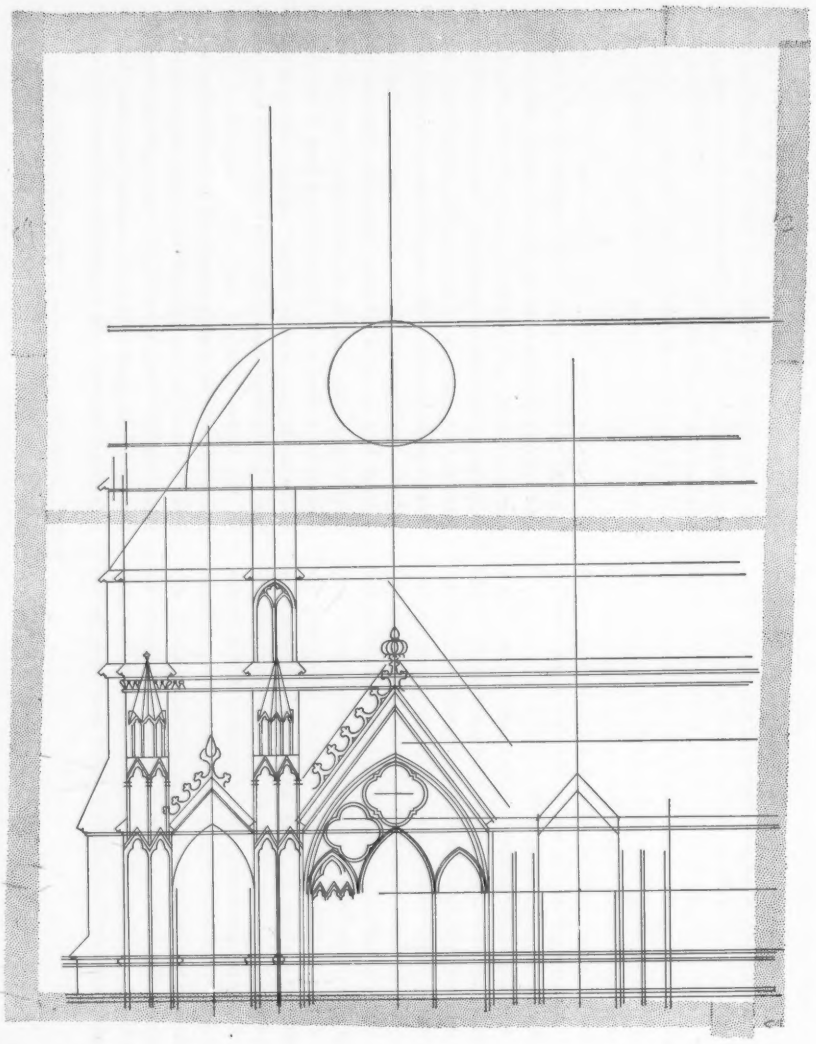


FIG. 3. Sheet A.

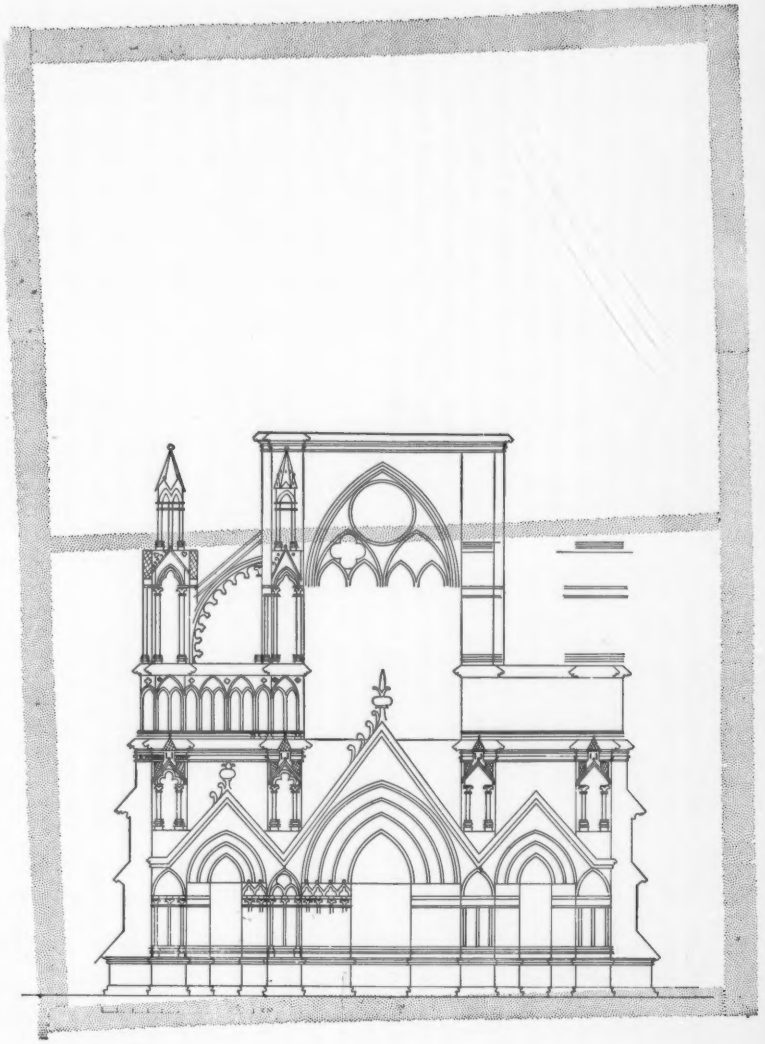


FIG. 4. Sheet B.

Fig. 3. Sheet A.

0 1 2 3 4 5 10 CM.

0 1 2 3 4 5 10 CM.

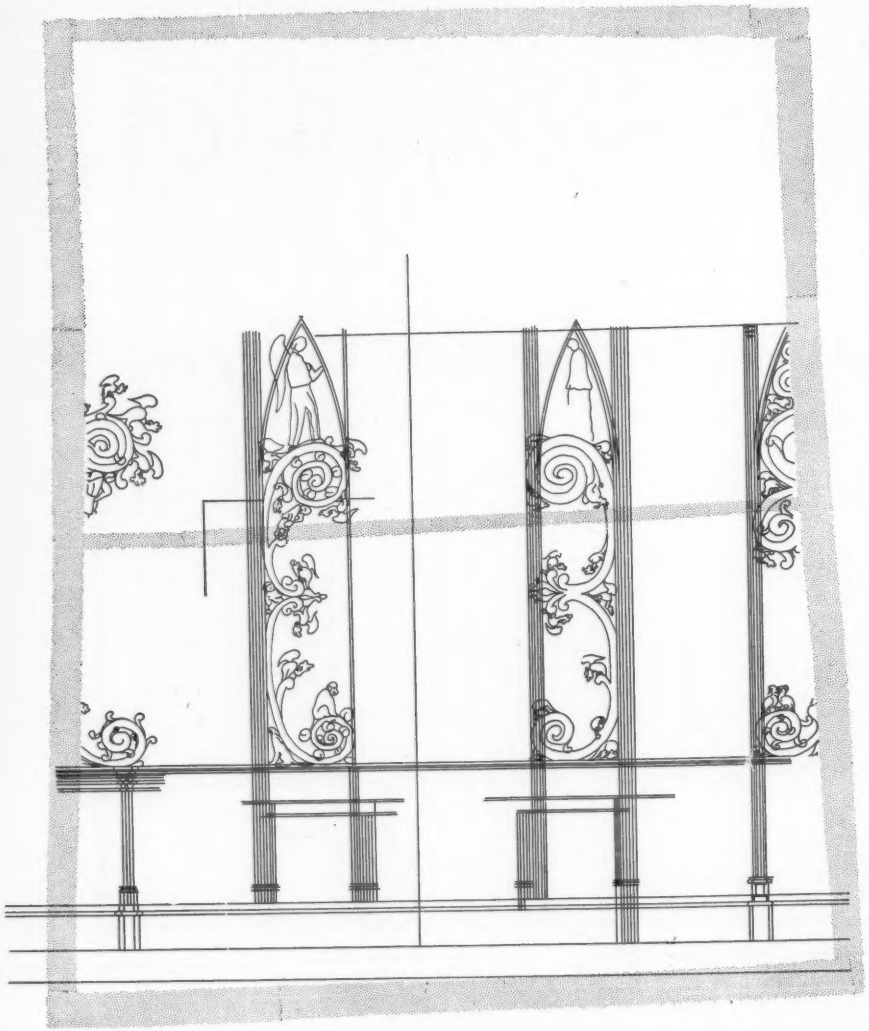


Fig. 5. Sheet C.

0 1 2 3 4 5 10 CM.

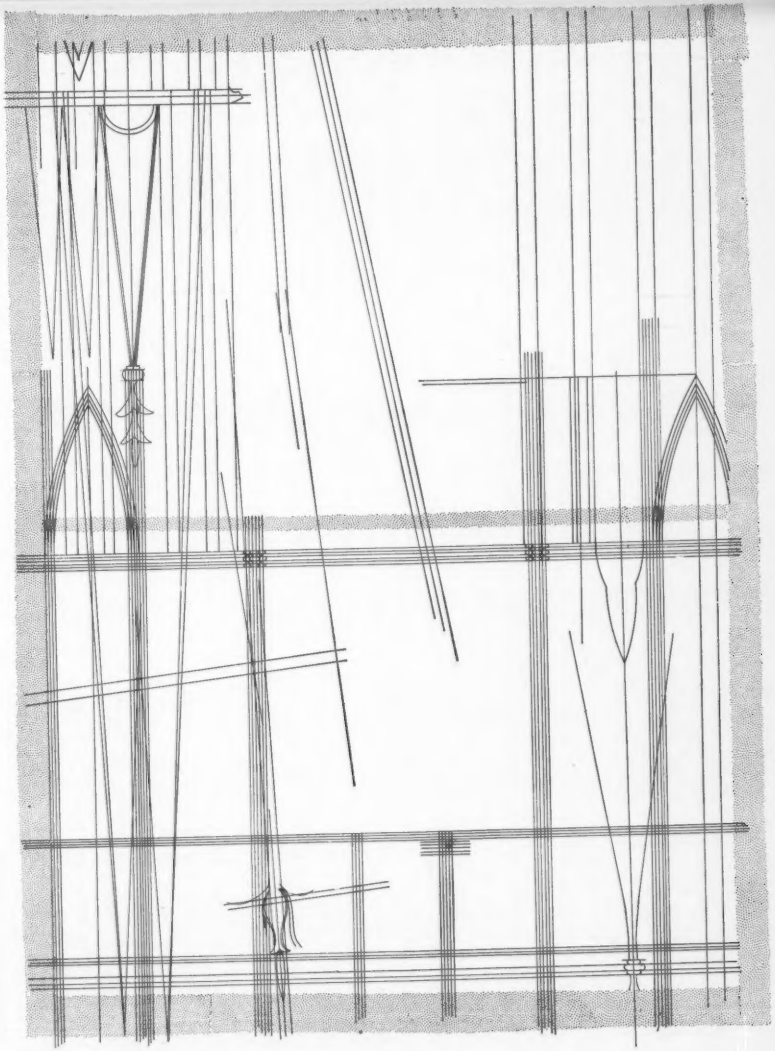


Fig. 6. Sheet D.

0 1 2 3 4 5 10 CM.

extrados. The upper end is to be supported by a colonnette resting on the cornice. The main gable crowning the central bay is the only major feature missing from the design.

Sheet C (Fig. 5) contains the terminal elevations of four great choirstalls, obviously to have been made from wood.[35] The pavement is indicated by a horizontal line, with two short rises or steps directly above. The seats are concealed by plain panels flanked by series of colonnettes. In the three right stalls, the colonnettes continue up both front and rear faces and are joined at the top by arches. In the extreme left design, these tall shafts are absent. The central pair of stalls are filled by large double-C forms. The extreme left stall may have had the same shape, but the critical central portion of the design is missing. The extreme right stall seems to have had a single C, somewhat taller than the others, with several tiered scrolls or spirals above. Here, too, however, a significant part of the design has been lost.

The stalls are decorated by carved crockets, monsters and figures. The monsters have long tails, wings and dragon's heads, and they perch on the crockets, coil in corners or affront each other in a heraldic manner. A monkey can be seen sitting on the lower scroll of the left central stall, and the corner of the same is occupied by a dog or similar quadruped. In the left pair, the upper scrolls are supported by small men with hands on hips, and in the central pair they are surmounted by angels.

Sheet D (Fig. 6) contains, at what is probably the lowest level (D-1), the architectural frames of four more choirstalls, without the carved ornament. The extreme left stall (reading Fig. 6 upside down) has colonnettes on both front and rear, supporting an arch; in the extreme right stall, one set of uprights and the arch, alone, are visible. The central pair have no arches and only one tall set of uprights each, but the latter have small mouldings at the level from which the arches would spring. As on A and B, these mouldings are formed within sets of parellel lines extending across the sheet, so that they can be repeated at other points in the drawing without remeasuring.[36]

A second level on D, inverted with reference to the stalls but on the same axes, contains fragments of façades (D-2) at a scale much larger than either A or B. In the upper left-hand corner (f. 85r), a great spire with a finial and an elongated trefoil opening rises from a horizontal line, and four sets of parallel lines descend from the moulding band of D-1 to the lower edge of the parchment.

The right side of the sheet (ff. 95r-96v) contains another fragment of a façade with a cornice above sets of parallel vertical lines similar to those on the left side but closer together. The top of a sharply pointed arch can be seen just below the cornice. Above it rise three small spires, the right pair identical and the left one slightly taller, with an elaborate finial above and a semicircle inscribed at the base. The vertical axis of this last spire runs up the entire sheet and must not be confused with the colonnettes of the choirstalls, which it penetrates.[37] Sets of parallel lines also rise above the cornice to the same point as on the left side of the page. The whole design is dominated by an enormous spire(?), based upon the cornice, that disappears off the parchment at the upper right-hand corner. Each side of this spire is formed by two converging lines that meet near the top edge of the sheet. From points just beyond the present edge, two more oblique lines that are not parallel to either of the sides of the spire move downwards and cross each other on the long vertical axis just noted.

A third design on D, in the top central part of the sheet, comprises a large finial cut by three parallel vertical and two horizontal lines (D-3). It looks very much like the top of a large spire. Further fragments, consisting of three sets of parallel lines on different axes, occupy the central and lower parts of the sheet (D-4).

It is clear that the "façade" fragments on this sheet are not related in any way to the monumental façades of A and B. In view of the exaggerated angles of the gables and the extremely pointed arches, they would seem to be designs for some form of miniature architecture, possibly in stone but equally likely in wood or even metal. In general aspect and in scale, they are related to F and the whole series may be fragments of elevations for the dossiers of the choirstalls, or conceivably for the object whose ground-plan I take to be represented in E-2. It must not be forgotten that some of the fragments such as D-3 and D-4 may have been essays or perhaps even unskilled work.

Sheet E (Fig. 7) contains, at the lowest level, the elevations of four clearstory windows (E-1). The arches are moulded and spring from responds composed of groups of colonnettes. There is not always an exact correspondence between the articulations of the arches and the responds, and the right pair is obviously incomplete. The windows comprise tracery with twin trefle lancets separated by a thin mullion, and quadrilobes. Vertical axes rise above the left and right responds, although the right one is not centered with respect to the respond or the arches.[38] What appears to be a central axis in the extreme left window may in fact be part of the next level of drawing (E-2). The base of the clearstory may be indicated by a horizontal line at the very bottom of the sheet that does not seem to belong to E-2, although the responds are apparently prolonged through it. Even if these windows terminated here, their proportions would be very elongated.

The upper level on E contains a plan inscribed in a right angle (E-2) (Fig. 8). From the apex, in the lower right-hand corner, the angle is twice bisected by radii that form axes on which the major elements are constructed. These consist, first, of groups of three colonnettes with bases, connected by semicircular walls; second, of three similar colonnettes grouped around the apex, where a fourth is probably omitted to render the radial axes more legible;

and, finally, of parts of two octagonal forms concentric to the apex. The outer octagon traverses the inverted arcs drawn from the axial colonnettes, and smaller arcs bend in from the corners of the octagon along the radii. Floral patterns are partly discernible on three of the axes. In the extreme right-hand corner are a regular arc connecting two parallel lines and, immediately adjacent to it, a lobe that resembles the profile of an ogive.

Due to an inefficient washing of the skin, the final stage of the drawing can be isolated from the preliminary lines,[39] which seem in several cases at least to be in the nature of an experiment (Fig. 9). Thus the semicircular walls connecting the colonnettes were prepared by two sets of horseshoe arcs that appear to have been trials, and the lines across the top half and left side of the sheet, parallel to the sides of the right angles, were not included in the final version.

Since the nature of the object represented in this drawing is not at all clear, it may be pertinent to point out certain difficulties which the design raises. The original drawing was probably not a complete octagon, since the upper-right and central groups of bases seem to return toward the radial axis farther than do those around the other two groups of colonnettes. The drawing would seem to "end" here. But it is impossible to determine whether one, four or six sides of the octagon were omitted—whether, in fact, we possess the whole, a quarter of the original or a mere half. The lower edge of the parchment is practically smooth, so that few traces of lines can be found, and the drawing was cut in such a way that even these indications, were they available, might not indicate how much farther the drawing extended.

Although architectural nomenclature has been used in the foregoing description of the drawing, it is difficult to consider it a plan for monumental architecture. The relationship between mass and space is such that, if the drawing is in scale, it cannot correspond to an ambulatory or chapter house. The central colonnettes would rule out a spire base. In addition, the manner in which the colonnettes and walls are joined clearly breaks all rules for the traditional bonding of masonry. The central portions—the octagonal forms and the lines parallel to the radial axes—may represent the plans of various levels of a tiered or towered object, in which case the drawing may have been intended for a piece of miniature architecture, in stone or wood, or perhaps in metal. The manner in which the bases surround the colonnettes seems to indicate an emphasis on internal rather than external use, however, especially since the outer joint of walls and colonnettes may not be clearly specified. And finally, if it be a tall and open object, such as the former altar at Maria-Laach,[40] one must solve the problem of how the various levels were joined to one another. In view of its inclusion on a page with clearstory windows, it seems safe to assume that the drawing represents an object normally designed by the architect, such as were the choir-stalls of C and D-1.

Sheet F (Fig. 10) contains the upper section of another gabled façade (f. 112v). Parts of four spires with finials and a gable can be discerned. The vertical axis of the gable is prolonged across the entire sheet and penetrates the drawing on f. 111r, which seems to be inverted with respect to f. 112v. This design is very fragmentary, but it may contain the peak of a large spire with traces of a finial and perhaps traces of smaller gables. The spire is unfortunately not part of the incomplete spire on D-2 (right).

The techniques used in the various drawings of MS G 661 merit special attention since it is here that the processes of thirteenth-century design are laid bare. The instruments used were probably simple ones—a straightedge, a compass with dry points and with a pen, and of course a pen itself. There may in addition have been a small square.

Each drawing seems literally to have been constructed, starting with one line and proceeding by the addition of other lines. The position of nearly every parallel line was first determined by pinpricks,[41] which may therefore be considered a key to the process. They are generally placed, not on a fictitious axis of reference, but on the edge of the design or within it; yet they rarely occur on the main vertical axes. Groups of pinpricks were added as the lines themselves were drawn. Certain lines, apparently by reason of their proximity to the next stage rather than their importance in the design, seem to have collected these groups and may have become lines of repair. But they never had an exclusive importance in this respect, since as often as not the next group of pinpricks was placed on another line just drawn. The designs thus seem to have grown piece by piece, governed only by symmetry and a sense of the size of the projected drawing with respect to the sheet.

There seems to be no evidence of any overall geometric or proportional system controlling the disposition of the major elements.[42] Even where one would most expect to find it, in the incomplete upper half of A, there are merely vertical axes and several sets of horizontals which can only with difficulty be interpreted as cornices—they are much more likely to have indicated capitals or similar details.[43] Likewise on E-2, the octagon seems to have been constructed by the simple method of bisecting an angle rather than by any of the late mediaeval systems such as Matthew Roritzer's.[44] Evidence that the general design was thought out beforehand and the details then worked out on the parchment can be found in the preliminary drawings of E-2, or in the choirstalls on C and D, where it is quite clear that the general format—shape, size and so on—was entered first, with minor variations such as the number of colonnettes, and then the carved ends drawn in. This does not seem to apply to A and B, although it can be seen to

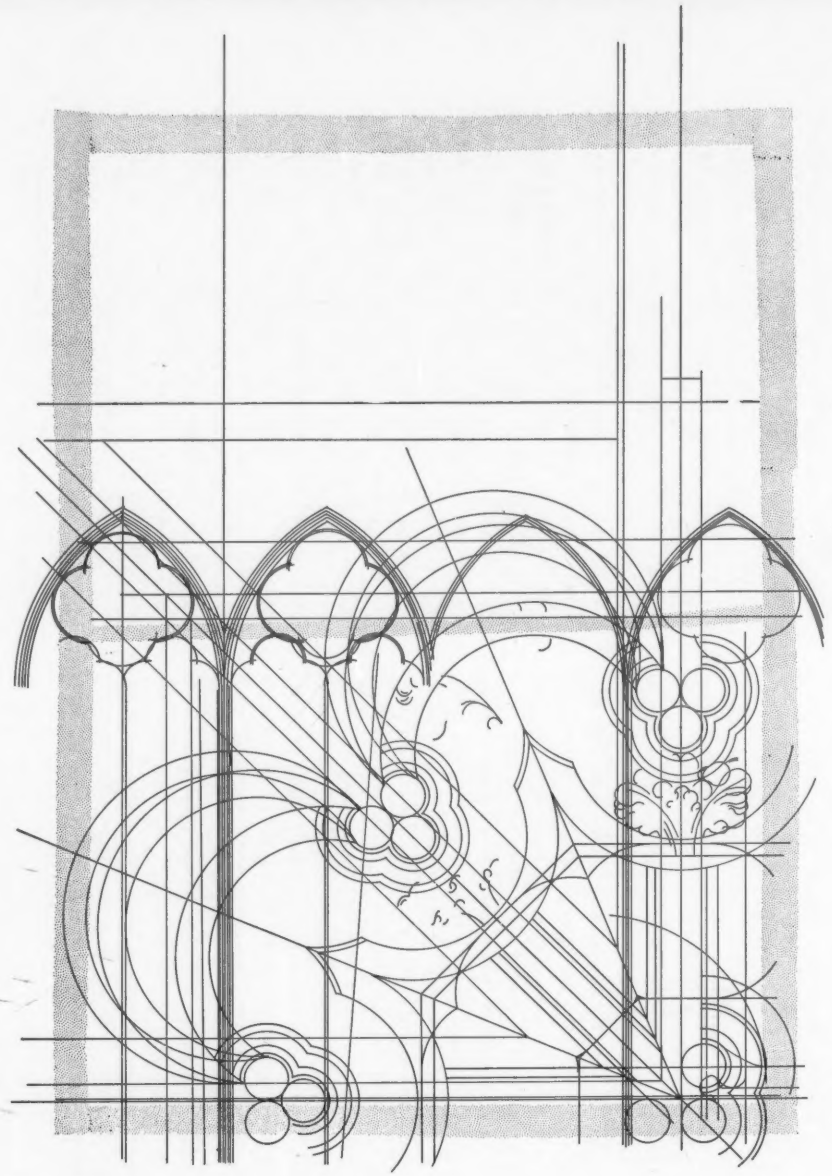


FIG. 7. Sheet E.

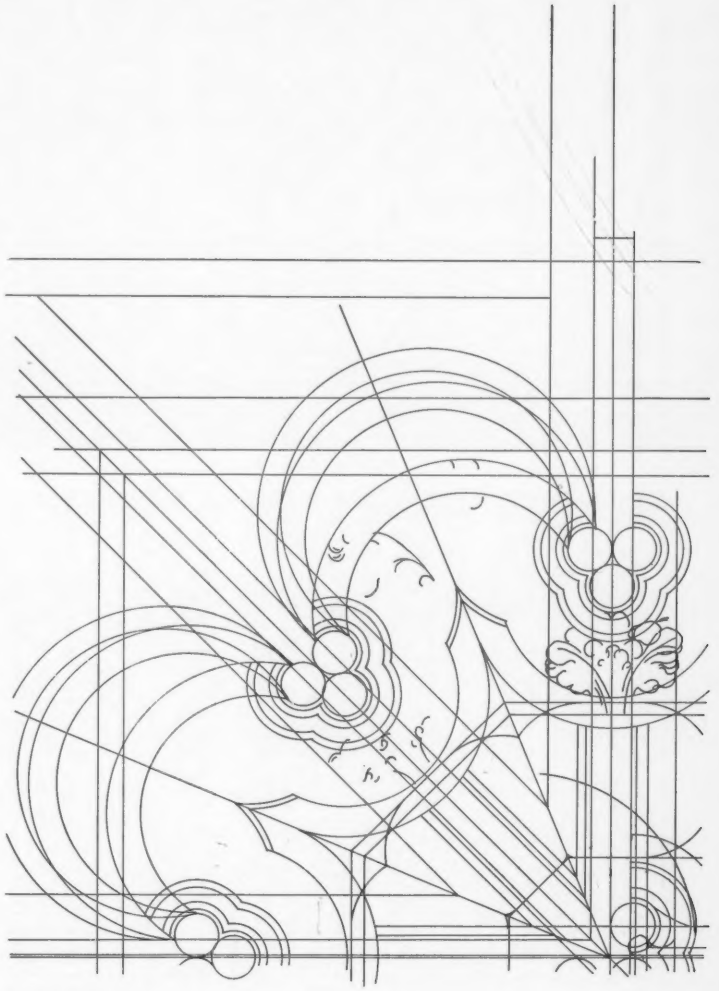


FIG. 8. Sheet E-2.

FIG. 7. Sheet E.

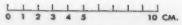
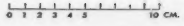


FIG. 8. Sheet E-2.



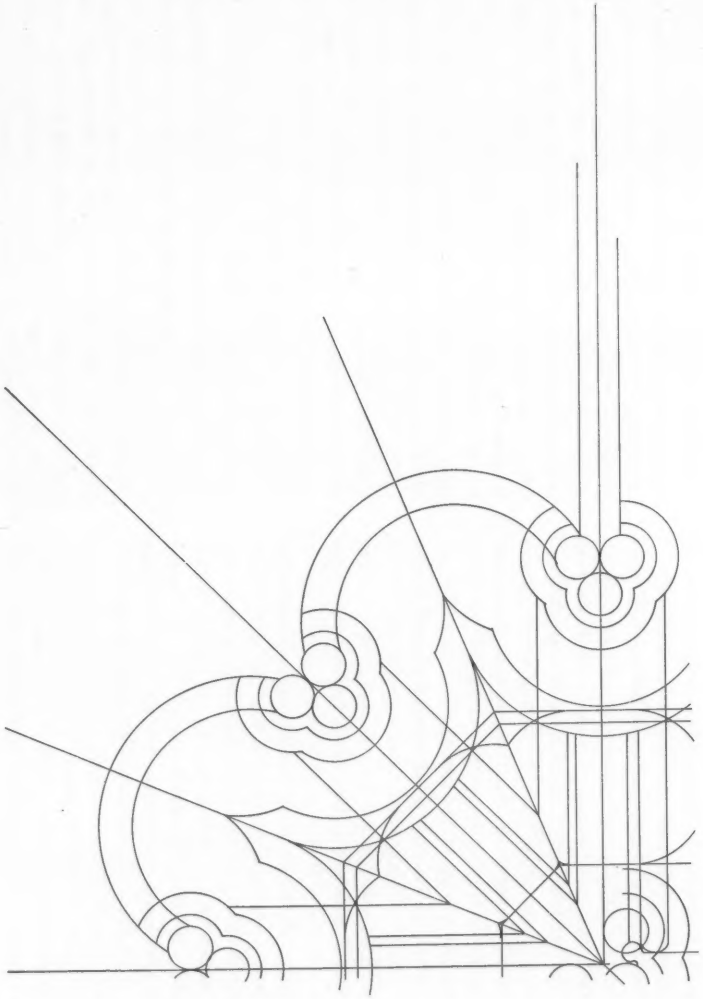
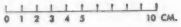


FIG. 9. Sheet E-2 (final drawing).



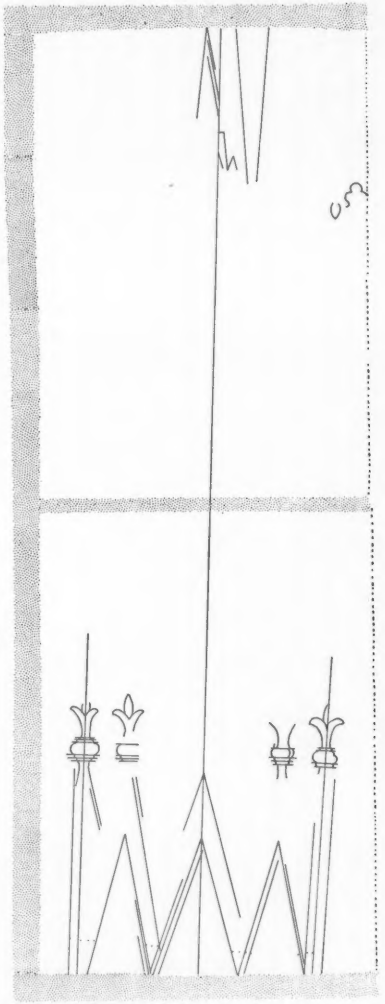
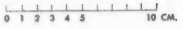


FIG. 10. Sheet F.



operate in the details, for instance with the sets of parallels determining the mouldings. The pinpricks for these elements seem to have been established with dividers; they are quite regular and those for the bases generally have a larger opening in the center. But in almost every instance, on each respective sheet, the distances between the pinpricks are almost, but not quite, equal; yet they remain proportionally the same from A to B, where the scale of the whole design becomes smaller. It must therefore be assumed that the size and position of everything was well in mind beforehand, but that changes were acceptable and frequent during the process of drawing. It would seem that there was at work here not a rigorous system but an excellent eye that could easily adjust to the scale and propriety of each design.

Certain systematic uses can of course be observed, especially in the major architectural elements. The pointed arch is in most cases constructed from centers lying on the inner edge of the innermost moulding (A, B and E-1, left pair). As an exception, in the central portal of A, the centers of the great arch lie about one-sixth of the way in across the base, and the centers of the large arch in the screen are consolidated with those of the side arches, lying at the outer edges of the free-standing columns. On E-1 (right pair) the centers lie approximately on the axes of the responds. The small trefle arches on B were constructed with two arcs from an axial center with a *tiers-point* arch above, those on E-1 on two centers with a semicircular arch above. The quatrefoils on A and B were laid out on cross-axes and the four centers found by tracing a circle across them. On E-1, however, the lower lobes are shallower and a good deal of hesitancy is revealed by the many holes in the parchment and the different radii of the arcs. The numerous variations seem to indicate only a general preference for certain forms, such as the *tiers-point* arch. When their use would have entailed a considerable readjustment of the neighboring elements, modifications were introduced.

There are, of course, many errors on the part of the draughtsman. Identical colonnettes vary in size, major axes are occasionally neglected, and so on. Sometimes the final relationship is not precisely clear, as with the clearstory tracery on E, which could scarcely be constructed from the drawing. Occasionally the ruler seems to have slipped, or the wrong pinprick was used, and a parallel line bends toward its neighbor. The reliance on drawing instruments was heavy. The free-hand work is almost entirely restricted to ornamental details—crockets, capitals and bases, finials and cusps, the tiny trilobes on B and the floral elements on E-2, and, of course, the choirstalls on C. In every instance, however, the firmness of the hand reveals a skilled artist.

There can be no proof that the drawings in G 661 were all made by the same hand. But they quite probably came from one shop, and numerous details suggest they may well have been the work of one draughtsman.[45] The regularity with which the sheets were processed in the parchment shop implies that they entered it as a group, and, further, that they may well have come from a single original source. One technique, the system of pinpricks for setting up parallel lines, is common to all the sheets, and this is quite different from that of the later Strasbourg shop,[46] which furnishes the only comparable body of material from the thirteenth century; at Strasbourg, no pinpricks were used at all. As for details, the same method of constructing the pointed arch is found on A, B and E, although not exclusively. The crockets, finials and cornice mouldings are similar on A, B, D and F, as are the quadrilobes on A, B and E, and the capitals on B and C. Finally, C and D may originally have been parts of the same sheet, as pointed out above. Whether the style of such details was common practice in many north French shops in the thirteenth century cannot, at present, be demonstrated; the capitals of the Reims palimpsest are clearly related to those of Villard de Honnecourt, while the finials, cornices and bases are quite unlike those on Strasbourg A, the oldest parchment from this shop (before 1275).

If it can be supposed that the drawings were largely or entirely made by one man, it cannot be assumed that they were all made at one time. A, B and C each contain one incomplete design, and although A and B may have been alternate schemes for the same façade, they differ considerably in conception. The multiple levels on D, E and perhaps F, as well as the possibility that these skins were assembled and reassembled into larger sheets, also suggests strongly the passing of time, as if the whole set of skins had been constantly employed in the shop during the execution of a major project—possibly one covering several decades.

There is no textual evidence as to how much earlier than 1263–1270 the drawings were made, or as to where the shop was situated. The gift of the skins by a local man may serve to confirm the stylistic evidence of A, B and E that the shop was in the neighborhood of Reims.

Although the architectural designs do not seem to have been executed, certain of their elements can be identified in the context of forms in northeastern France in the decades 1230–1260. The clearstory windows on E-1 contain quadrilobes and trefle lancets, the normal oculus and pointed arch being noticeably absent.[47] This design was not possible before the façade of Amiens (1221). It was probably first used as a window, or as free-standing tracery, on the façade of the destroyed abbey of St.-Nicaise at Reims (after 1231). In both monuments, the round-headed arches and trefles are dominant—they also occur on A—and the form seems to have persisted after about 1250 only in the immediate vicinity of Soissons.

The towerless façade of B may have been for a transept.[49] The ornateness of the design, with aediculae, arcades and

cusps, makes it unlikely as a west façade until much later in the thirteenth century, when parish churches began to adopt cathedral-like façades, but without towers.[50] If B represents a transept, the presence of the three portals is important. Towerless, three-aisled transepts were used by the Cistercians early in the thirteenth century,[51] and at the Cathedrals of Soissons, Amiens and probably St.-Omer.[52] The abbeys, whether Cistercian or not, preferred this plan, generally with one bay of the western aisle absorbed by the adjacent cloister.[53] But very few transepts before 1260 seem to have had three aisles *and* three portals, a design worked out at Chartres [54] and repeated at Reims, both of which, however, had towers. The north transept of Soissons is towerless, but the evidence for the original number of portals has unfortunately been obscured by the fourteenth-century reworking of the ground story. The two edifices which correspond perfectly to the *parti* of B, Westminster Abbey and León Cathedral, have long been recognized as deriving in general from the Cathedral of Reims. The existence of B may require a slight redefinition of this influence, since transept towers were fundamental to the massing of Reims through all the changes of program there. The source which produced B was undoubtedly a variant of Reims that conformed both to the three-portal design of the Cathedral and to the towerless type in vogue in the region; it perhaps formed an intermediary between Reims and Westminster or León. This may also apply to the date of B—Westminster was begun in 1245 [55] (León was under construction only in the 1250's),[56] and it seems possible to date B slightly earlier, but after the Reims transepts, hence around 1240.

A seems later than B, in view of the greater profusion of ornament, the open octagonal aediculae, the pointed buttresses and the screened portal. The latter feature is undoubtedly the most significant one for the chronology, since screened portals were apparently first used by Hugh Libergier at the Abbey of St.-Nicaise. And since St.-Nicaise is pivotal in some other respects for A, it may be well to note here a few pertinent facts and to formulate some hypotheses about this destroyed abbey.[57]

The nave of St.-Nicaise was undertaken by Libergier in 1231 and probably completed around 1256, when the bells to be placed in the western towers were paid for. It is reasonable to assume that Libergier went on with the transept after the nave had been terminated, since the accounts continue without interruption through 1262 and the architect died in 1263, when work seems to have stopped for three years. The three portals of the west façade were linked together by a series of seven gables that covered the buttresses and screened the openings. The design of this story was so much more elegant and elaborate than the remainder of the façade, however, that it looks like a later addition. As this portion of the edifice was the immediate source for the design of the choirscreen at Strasbourg Cathedral, which seems to have been in place in 1252,[58] one might consider the revision at St.-Nicaise to have occurred around 1245–1250, perhaps just before the planning of the south transept, where a single screened portal was built.[59] Sheet A could then have been made about 1250. Other details of A, such as the pointed buttresses, are not in conflict with this date.[60]

The similarity of the choirstalls on C to those of Villard de Honnecourt (ideal date about 1230–1235) has already been noted.[61] Once again the greater elaboration of motifs and the introduction of fauna make it unlikely that C could have been quite as early as the 1230's, and a date of 1240 or later seems more plausible. This would apply to D-1 if, in fact, it had originally been connected to C.

Only F defies even a tentative date. The similarities of the motifs, such as the finials, to those on D, however, suggest it was not made before the decade 1230–1240, the *terminus post quem* for the other sheets of the group.

The evidence from the architectural drawings points to the provenance of the whole group from northeastern France, from an Amienois shop in the vicinity of Reims, such as St.-Nicaise. There is a bare possibility that the group of drawings was in fact the work of Hugh Libergier, although the relative dimensions of the abbey church do not correspond very well with the proportions of façades A and B.[62] It is more likely that the shop was located somewhere in the vicinity, perhaps toward Picardy, where centuries of war have obliterated almost all thirteenth-century monuments.

The designs of G 661 seem totally unrelated, in size and detail, to the drawings in Villard's manual. They were certainly not copies of buildings, like the *aide-mémoire*, Strasbourg 21.[63] Were they projects of the kind submitted for approval, as one supposes Strasbourg A to have been? Or were they intended, once complete, to serve as guides for actual construction, like Strasbourg B and C? To what degree are we justified in generalizing from the hesitancies and revisions so noticeable on E, to conclude that these were merely an apprentice's exercises? The answers to these questions are obscure. Only the fact that none of the designs can be dated before 1230–1240 may suggest that we are in the presence of new shop procedures—the prior rendition in black and white of what was to be constructed.[64] After about 1230, structural and spatial speculations ebbed temporarily [65] and architects seem to have concentrated on elaboration of design. The *drawing* is appropriate for this, whereas it could serve only as a kind of shorthand in the rendering of mediaeval spatial or structural concepts. This might explain why the clearest and most vigorous of the large thirteenth-century drawings were façades, easily reducible to two dimensions. These and many other problems posed by G 661 still remain, however, and it is hoped that this preliminary publication may be of service in solving them.

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1. At Milan. See P. Frankl, "The secret of the mediaeval masons," *Art Bulletin*, 27 (1945), 46–60, and J. S. Ackerman, "'Ars sine scientia nihil est'," *ibid.*, 31 (1949), 84–111.

2. E.g., G. Kubler, "A late Gothic computation of rib vault thrusts," *Gazette des Beaux-Arts*, 26 (1944) [1946], 135–148, and P. Booz, *Der Baumeister der Gotik* (*Kunstwissenschaftlichen Studien* 27) (Munich, 1956).

3. *Archives de la Marne*, G 661, on permanent loan to the *Archives de la Ville de Reims*.

4. P. Varin, *Archives administratives de la ville de Reims* (*Collection de documents inédits pour servir à l'histoire de France*) (Paris, 1838), I, Pt. 1, cxv-cxvi.

5. A. N. Didron, "Dessins palimpsestes du XIIIe siècle," *Annales archéologiques*, 5 (1846), 87–94.

6. F. de Verneilh, "Construction des monuments ogivaux," *Annales archeologiques*, 6 (1847), 139–144.

7. H. R. Hahnloser, "Entwürfe eines Architekten um 1250 aus Reims," *Résumés, XIIIe Congrès international d'histoire de l'art* (Stockholm, 1933), pp. 260–262, and *Actes*, p. 163, Fig. 8.

8. Cf. L. Demaison in *Bulletin de la Société nationale des Antiquaires de France* (1932), pp. 133–135 and G. Robert in *Inventaire-sommaire des archives départementales antérieures à 1790, Marne, Archives ecclésiastiques, série G, clergé séculier* (Reims, 1940), II, Pt. 2, 50. I should like to express my thanks to M. René Gandilhon, *Archiviste en chef des Archives de la Marne*, to Mlles. D. Cateland and F. Coutansais, the former and the present *Archivistes de Reims*, and to Mr. James Grote Van Derpool, Director of the Avery Library, Columbia University, for their courteous assistance in the preparation of this study.

9. Twenty paper folios containing excerpts made from another Reims obituary by Claude Etiennot in 1688 are bound in the back of the volume. See G. Robert, *op cit.*, pp. 50–51.

10. "Et dedit hunc librum martyrologium," (Varin, *Archives législatives*, II, Pt. 1, 77, col. 1). He was dead when the obituary was written and presumably had willed the parchment to the chapter. I am advised by Mlle. Coutansais that Rosceium is probably Roizy (Ardennes), rather than the more famous Roucy (Aisne).

11. He was alive on 20 June 1263 (Varin, *Archives administratives*, I, Pt. 2, 818).

12. According to the obituary, he died on 20 August. See Varin, *Archives législatives*, II, Pt. 1, 89. The dates 1276, given by Varin (*Archives administratives*, I, Pt. 1, cxv), and 1272, given by Robert (p. 47) and Hahnloser (*Résumés*, p. 261) are thus too late. Didron (*Annales*, pp. 87–88) gives 1270. It is normal to assume that the death of the head of the diocese would be registered at once in all local obituaries.

13. F. 118v may have remains of part of a design on the left margin, but they were too faint to read.

14. Ff. 126r, 127r, 149v, 150v, 151v, 152v and 153r-v, recorded as blank by Robert. The text, which has thus far resisted attempts at deciphering, would seem to be an autograph, and theological in nature (cf. "apostolus" on f. 152v, line 20). I am indebted to Messrs. E. T. Silk, of Yale University, and P. O. Kristeller and I. Sevchenko, of Columbia University, for their assistance on this question.

15. Although f. 128 starts a new quire.

16. This is indicated by the distortions of lines drawn with ruler or compass. F. 112v is perhaps the clearest example.

17. The manner in which the drawings were cut and bound means that the sheets could not have been folded in the procedure outlined by G. Pollard ("Notes on the size of the sheet," *The Library*, Series 4, 22 (1942), 105–137). I am indebted to Mr. Joseph Rubinstein, Curator of Special Collections in the University of Kansas Library, for this reference.

18. There are four pinpricks at the top and bottom of each leaf, since each left margin has two lines forming a column for the day of the month.

19. The designs on these leaves are fragmentary but are not prolonged onto the other halves (ff.118v, 117r).

20. As is indicated by the present irrational edges of some completed parts of the drawings and by gaps that appear when the leaves are fitted into their original positions with respect to each other.

21. The six horizontals at the base of the arches on D, alone, do not seem to have been prolonged onto C, although a good part of the area they would occupy on the latter sheet was trimmed off. C itself is incomplete, since at least 7 to 8 cm. of the drawing are missing.

22. In Strasbourg D, for instance, the lower sheet measures 1m.03 by 1m.09 (author's measurements, 1956). See J. Knauth, "Erwin von Steinbach," *Strassburger Münsterblatt*, 6 (1912), 7–52. An average size of 3 ft. by 4 ft. for sheepskin, and 4 ft. by 6 ft. for cowhide, is suggested by Pollard.

23. The left edge of f. 100v and the right edge of f. 105r require additions of about 6 cm. each, to complete both levels of the designs; the lower edges of these leaves require about 8 cm. for the same purpose.

24. No one seems to have consulted the originals again before Hahnloser. Thus B, as it is reproduced by A. L. Frothingham (*A History of Architecture* [New York, 1915], Vol 3, Fig. 53), G. G. Coulton "Artist life in the Middle Ages," *Burlington Magazine*, 21 [1912], Pl. opp. p. 341, d) and J. Harvey (*The Gothic World* [London, 1950], Fig. 11), is merely a reprint of Lassus' rendering. A. Choisy (*Histoire de l'architecture* [Paris, 1899], Vol. II, Fig. 50) used the same figure for a geometrical analysis. E-2 was reproduced in the same manner by Frothingham, Fig. 87a.

25. Three, at least, are clearly discernible. They are, presumably from the bottom, 1) the frames for the choirstalls; 2) (or 3?) fragments of a façade with gables (ff. 95r–96v) and a spire (ff. 85r–86v), the latter possibly part of another design; 3) (or 2?) a finial (atop a spire?), on a different axis from the foregoing (f. 96v). The second and third levels cannot be separated chronologically on internal evidence alone. In addition, ff. 85r, 95r and 96v contain several sets of parallel lines on still other axes, possibly constituting a fourth level.

26. I wish to thank Mlle. Chabrier, Directeur du Service Photographique, and M. Porchaize, Chef Photographe, both of the Bibliothèque Nationale in Paris, for the special attention they gave to photographing the palimpsested folios. The ultra-violet negatives are numbered as follows: in the Archives Photographiques (Paris), 55-N-237 through 55-N-250 (ff. 87r, 91r, 93r, 95r, 99r, 101r, 103r, 105r, 88v, 90v, 106v, 100v, 94v, 101v in this order); in the Bibliothèque Nationale (Paris), B 33 UV through B 46 UV (ff. 153r, 112v, 96v, 86v, 126v, 127r, 153v, 151v, 149v, 152v, 89r, 85r, 111r, 150r in this order).

27. Most later architectural designs are also on assembled sheets, as is the ninth-century plan of St. Gall (H. Reinhardt, *Der St. Galler Klosterplan, 92. Neujahrsblatt, Historisches Verein des Kantons St. Gallen* [St. Gall, 1952], pp. 8–9).

28. Cf. Didron, 1846.

29. The ground level may be indicated by the three parallel lines at the lower edge of f. 91r.

30. Lassus' reconstruction here is gratuitous, since there is no evidence for the central trefle in the MS.

31. One preliminary line parallel to the gable, delimiting the edge of the cusps, is quite clear; a second similar line to the right seems to have no explanation.

32. The trilobes are drawn freehand. Similar perspective details on an otherwise plane projection can be found in the aediculae on Strasbourg A. Cf. the buttresses in Villard's elevation of Reims (p. 62).

33. Cf. Didron, 1846.

34. These details are not on the correct vertical axis.

35. Details reproduced by Lassus, who failed to identify many of the decorative motifs as monsters (Didron, 1846). Hahnloser (1933) reproduced the left half of the sheet.

36. This band does not occur on C, and it is sufficiently related to the next level on D to make one wonder whether it could in fact be part of D-2 rather than D-1. The portion of the mouldings on the uprights, alone, would seem to justify its inclusion in D-1.

37. There is not enough space to enter two similar spires to the left of the central one.

38. The central respond is presumably concealed by the crease of the parchment and has not been reproduced here.

39. The floral motifs are extremely faint and therefore may not have been part of the final version; but it should be remembered that they were probably drawn with a pen rather than a drafting instrument and may not have left as deep impressions in the parchment as the arcs and straight lines.

40. See A. Schippers in *Kunstdenkmäler der Rheinprovinz*, XVII, 2 (1941), 318–319.

41. Except E-2.

42. Ratios of 4:5, as well as certain simple multiples, can be found on A and B. Choisy's analysis of B is gratuitous (see note 24).

43. The distance from the base to the top of the rose is twice that from the base to the top of the cornice with crockets.

44. See notes 1 and 2.

45. See Hahnloser, *Résumés*, p. 260.

46. See note 22 and Stehlin-Reinhardt-Fels, "La façade de la cathédrale de Strasbourg," *Bulletin de la Société des Amis de la cathédrale de Strasbourg*, Series 2, 3 (1935), 15–27.

47. The unframed quadrilobe also occurs on A and B.

48. See E. Brunet, "La restauration de la cathédrale de Soissons," *Bulletin monumental*, 87 (1928), 65–99, esp. pp. 93–94; and E. Lefèvre-Pontalis, "Abbaye de Saint-Jean-des-Vignes," *Congrès archéologigue* (Reims), 78 (1911), I, 348–358.

49. As suggested by Hahnloser, *Résumés*.

50. E.g., St. Julien at Royaucourt (L. Broche in *Congrès archéologigue*, [Reims], 78 [1911], 403–405).

51. Longpont (Aisne) (E. Lefèvre-Pontalis, "Abbaye de Longpont," *Congrès archéologigue, op. cit.*, pp. 410–420), Royaumont (H. Goüin, *L'Abbaye de Royaumont* [Paris, 1949]), and so on.

52. J. de Pas, "St.-Omer. Cathédrale," *Congrès archéologigue*, 99 (1936), 475–514. The transept ends were later rebuilt, but the early thirteenth-century portions show no strengthening to support towers.

53. E.g., Royaumont, St.-Nicaise at Reims (see note 57), St.-Thierry (H. Bertrand, "L'Abbaye de St.-Thierry," *Annuaire-bulletin de la Société des Amis du vieux Reims*, 1929–1930, pp. 83–116), St.-Jean-des-Vignes at Soissons or Westminster.

54. L. Grodecki, "The transept portals of Chartres cathedral," *Art Bulletin*, 33 (1951), 156–164.

55. G. Webb, *Architecture in Britain. The Middle Ages* (Baltimore, 1956), p. 109.

56. E. Lambert, *L'Art gothique en Espagne* (Paris, 1931), pp. 238–240.

57. Ch. Givelet, "L'Eglise et l'abbaye de St.-Nicaise," *Travaux de l'Académie de Reims*, 98, 2 (1894–1895 and 1897); H. Deneux, "L'Ancienne église St.-Nicaise de Reims," *Bulletin monumental*, 85 (1926), 117–142. The relationship of G 661 to St.-Nicaise was noted by W. Burgess ("Architectural drawings in the Middle Ages" [ed. W. Papworth], *Transactions, Royal Institute of British Architects*, New Series 3, 53 [1887], 235–245).

58. H. Reinhardt, "Le jubé de la cathédrale de Strasbourg et ses origines rémoises," *Bulletin de la Société des amis de la cathédrale de Strasbourg*, Series 2, 6 (1951), 19–28.

59. See the plan in Deneux, *loc. cit.* A date in the late 1240's would be more in keeping with the well-known designs of the Paris Cathedral transepts (M. Aubert, *Notre-Dame de Paris. Sa place dans l'histoire de l'architecture du XIIe au XIVe siècle* [2nd ed.; Paris, 1929], pp. 151–155).

60. The pointed buttress, for instance, is found on the transepts of Paris Cathedral in the 1250's, at St.-Urbain de Troyes in the 1260's, and at St.-Jean-des-Vignes at Soissons in the 1270's. Cf. St.-Riquier, after 1257 (G. Durand, *L'Eglise abbatiale de St.-Riquier*, in *La Picardie historique et monumentale* [Amiens-Paris, 1907–1911], Vol. IV, Fig. 24).

61. Hahnloser, *Résumés*, and his *Villard de Honnecourt* (Vienna, 1935), pp. 155–156 and 158.

62. Measurements of the plan and of the elevation of one bay are indicated on the undated plans in the Archives Nationales, Paris (N. III, Marne 4, No. 6, mentioned by Givelet, 1894, p. 63). The nave vault was 97 ft. tall at the wall-rib. The south transept was 41 ft. wide (central aisle, axial), +20.5 ft. (western aisle, axis to interior wall surface); the width of the eastern aisle is not specified.

63. O. Kletzl, "Ein Werkriss des Frauenhauses von Strassburg," *Marburger Jahrbuch für Kunstwissenschaft*, 11 (1939), 103–158.

64. P. Booz (pp. 67–69) is of the opinion that such a procedure was used before the second quarter of the thirteenth century, although his evidence is textual, and the terms used (e.g., *designator*) do not specifically indicate that drawings were made. For a possible parallel, see my "Note on Gothic architects and scholars," *Burlington Magazine*, XCIX (1957), 372 and 375.

65. Suggested by J. Bony in the *Burlington Magazine*, XCV (1952), 111–112.

THE THREE-DIMENSIONAL ARCH FROM THE SIXTEENTH TO THE EIGHTEENTH CENTURY

NIKOLAUS PEVSNER

To STUDENTS in the United States and in England, Balthasar Neumann's Vierzehnheiligen has for various reasons become the epitome of the German Baroque if not the Baroque altogether. Some of the reasons are accidental—for instance that both Sigfried Giedion [1] and I [2] have singled it out for detailed analysis in preference to other equally deserving and exciting buildings—others are wholly legitimate. The foremost of these is that in the interior of Vierzehnheiligen (Fig. 1) spatial coalescence is carried to an unprecedented extreme. The chief vehicle for accomplishing this is the three-dimensional arch or, as Mr. Giedion says more picturesquely, the "warped-plan binding arch."

German scholars have been successful in tracing Neumann's immediate models. As early as 1889 Cornelius Gurlitt traced the ancestry of K. I. Dientzenhofer's Banz Abbey to Guarino Guarini.[3] Since then the problem has been proved more complex, but remains essentially the same. The Würzburg Palace Chapel (Fig. 2) and the Schönborn Chapel at Würzburg (Fig. 3) have been drawn into the discussion, the former with the same three-dimensional transverse arches as Vierzehnheiligen, the latter with two oval side chapels interlocked with a circular central room and the connecting arches reaching the central dome by swinging outward at the same time as upward. The Schönborn Chapel was begun in 1721, the Palace Chapel designed about 1731, Vierzehnheiligen in 1742. But the foundation stone at Banz was laid in 1710. The dependence of Banz on Guarini is beyond doubt. It may have to be explained by way of direct use of the plates of his *Architettura Civile* (Fig. 4) which came out in 1686 or by way of Bohemia, where Březnov is similar to Banz, where Lukas von Hildebrandt in 1695 had built a church at Gabel (Fig. 5) which clearly anticipates the Schönborn Chapel, and where Guarini had contributed designs for a church in 1679. So far nothing need be added to what German textbooks contain and what was summed up by A. E. Brinckmann in *Von Guarino Guarini bis Balthasar Neumann.*[4]

But where did Guarini get the idea of the three-dimensional arches which occur in his work in both the forms of transverse vaulting arches and of arches curving inward to support domes? The curving outward as at Gabel and the Schönborn Chapel is not to be found in Guarini. For this Miss E. W. Grashoff in a remarkably interesting article [5] has pointed to Philibert Delorme's chapel at Anet, illustrated in his *Architecture* of 1567,[6] as its prototype. Immediate connection between these two does not at first sight appear very probable, but links may be missing.[7]

For three-dimensional arches in vaults I suggest another origin. To light a vaulted church there are several possibilities according to the system of vaulting used. With groined or rib vaults the solution is obvious. The lunettes in which the windows stand are simply continued as two cells of the bay. With tunnel vaults difficulties at once arise unless a separate clerestory is inserted; which is somewhat risky owing to the weight of the vault (but see St. Etienne, Nevers, and, in the Renaissance, Sangallo's Annunziata at Arezzo). Alternatively, a compromise between groined and tunnel vault could be chosen by which the transverse tunnel vaults intersecting the main tunnel vault are of smaller diameter and therefore only cut into the main vault from left and right without meeting along the ridge line. Thus pointed penetrations result and high side lighting is possible in just the same way as with mediaeval (or Renaissance) groined and rib vaults. This was done, for example, at the Santo in Padua,[8] S. Maria degli Angeli in Siena,[9] in Serlio's Book V of 1547,[10] in Palladio's S. Giorgio Maggiore, and in all probability also in the Gesù.[11] After that it appears in della Porta's S. Maria de' Monti [12] and in S. Andrea della Valle and elsewhere.[13]

But High Renaissance architects did not like the lack of precision and the tendency toward the merging of separate parts with each other which are unavoidable in this solution. So Raphael in the *School of Athens*, and Bramante (and Michelangelo still) at St. Peter's avoided the fenestration of tunnel vaults altogether. If for some reason windows seemed necessary or desirable they preferred oblong windows which could be cut straight into the surface of the

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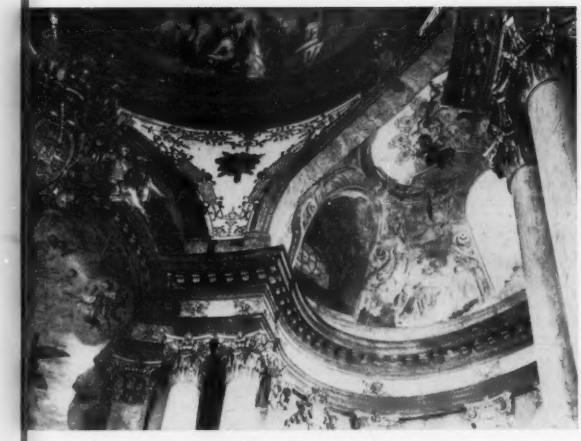
Fig. 1. Vierzehnheiligen. The pilgrimage church. Interior looking northeast. (Photo F. Stoedtner, Düsseldorf)

Fig. 2. Würzburg. The palace chapel. Interior. (Brinckmann, *Von . . . Guarino bis . . . Neumann*, p. 9)



ig. 3. Würzburg. The Schönborn Chapel. Vaulting detail. W. Boll, *Schönbornkapelle*, 1925, Pl. 63)

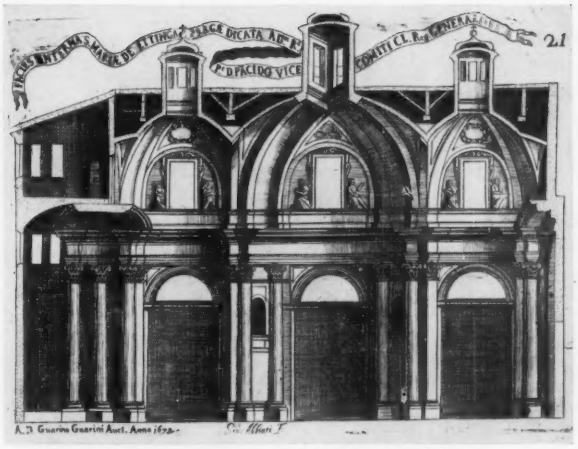


Fig. 4. Guarino Guarini engraving of St. Mary's, Altötting, Bohemia. Longitudinal section. (*Architettura Civile*, 1737 ed., Pl. 21. Courtesy Avery Library)

vault without any spatial complications. This device is first seen, so far as I know, in the chancel of S. Maria del Popolo,[14] a work of *c.* 1510 close to Bramante, and then in the courtyard of Peruzzi's Palazzo Massimi.[15]

The hardness and precision of this device could not appeal to Baroque architects bent on introducing the very interactions of parts which it succeeded in eliminating. Nor was the sharp, angular form of the pointed lunette of the Gesù an ideal Baroque solution. So we find with the coming of the seventeenth century a new method introduced, the one particularly important in our context. Maderna in the nave of St. Peter's did what Vignola had designed for the

Gesù, but instead of carrying his lunette to a point he ran a tunnel-vaulted penetration following the shape of his round-headed windows straight against the main tunnel vault (Fig. 6). Now the line of intersection between these two tunnel vaults of different diameter is bound to take the shape of a three-dimensional arch. I do not feel certain that Maderna was the inventor of this new and emphatically Baroque conception. Once introduced, however, it spread quickly and appears—to name only three widely separated examples—in F. Mansart's Val de Grace,[16] Wren's St. Paul's, and Gaulli's redecoration of the Gesù.

I should like to submit to colleagues the suggestion that these warped lines of intersection are the real origin of the three-dimensional arches of Vierzehnheiligen, insofar as they imply for the first time [17] an appreciation of curvature in space.

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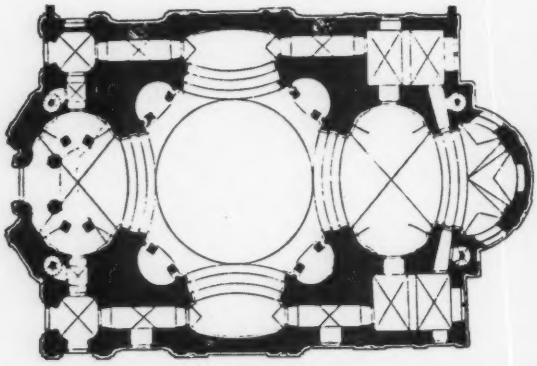

FIG. 5. Gabel, Bohemia. St. Lawrence's. Plan. (Brinckmann, *op. cit.*, p. 4)

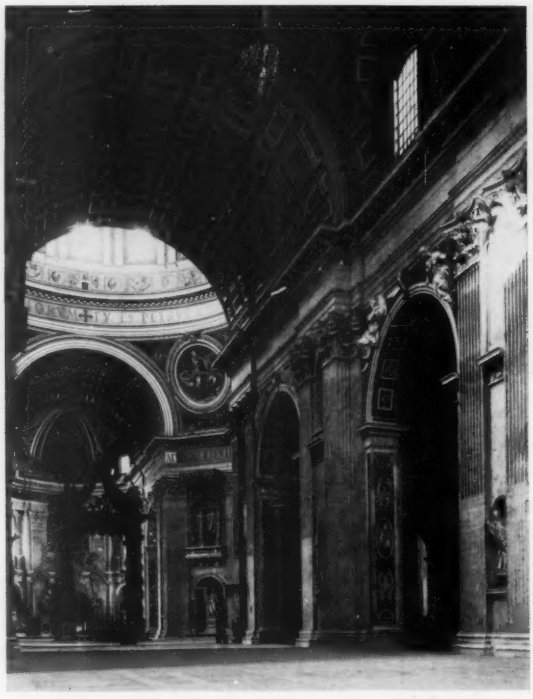

FIG. 6. Rome. St. Peter's. Nave showing window piercing barrel vault. (Gabinetto Fotografico Nazionale)

1. Sigfried Giedion, *Space Time and Architecture* (Cambridge, Mass., and London, 1st edition, 1941), pp. 61 ff.

2. Nikolaus Pevsner, *An Outline of European Architecture* (Penguin Books, Harmondsworth, Middlesex, 1st edition, 1942), pp. 100 ff.

3. Cornelius Gurlitt, *Geschichte des Barockstils und des Rococo in Deutschland* (Stuttgart, 1887), p. 203.

4. This lecture was delivered on June 11, 1932, before a meeting of the Deutscher Verein für Kunstwissenschaft in Berlin and was published there in that year by the Verein.

5. E. W. Grashoff, "Die Schlosskapelle von Anet und die deutsche Barock-architektur," *Zeitschrift des Deutschens Vereins für Kunstwissenschaft*, VII (1940).

6. Philibert Delorme, *Le premier tome de l'architecture* (Paris, 1567). The most easily accessible illustrations are in Anthony Blunt, *Philibert de l'Orme* (London, 1958), Plates 18 and 19.

7. It is, incidentally, very characteristic of the changed attitude amongst architects and scholars toward three-dimensional effects that Sir Reginald Blomfield writing on Delorme in *The Architectural Review* in 1909 (XV, 49) said that the three-dimensional arches give "a very ugly line."

8. Jakob Burckhardt, *Geschichte der Renaissance in Italien* (Esslingen, 1920), p. 154.

9. Roberto Papini, *Francesco di Giorgio Architetto* (Florence, [*c.* 1940]), III, Pl. 5.

10. Sebastiano Serlio, *Tutte l'opere d'architettura . . .* (Venice, 1569 ed.), p. 391.

11. G. de' Rossi, *Insignium Romae Templorum Prospectus* (Rome, 1684), Pl. 20.

John Coolidge in a letter to the writer pointed out several obscure points regarding Vignola's original intentions for the vault. As it was built it is probably the conception of della Porta. Its present appearance, however, is due to Gaulli's alterations.

12. Burckhardt, *op. cit.*, p. 155.

13. This device was not unknown in the Middle Ages either. See, for example, the timber tunnel vault with pointed penetrations on the *Pentecost* page of the *Boucicaut Hours* in Paris—so far, I think, unpublished. Mrs. R. Shilling showed me a photograph.

14. Illustrated in Adolfo Venturi, *Storia dell'arte italiana* (Milan, 1901–39), X, Part 1, 95.

15. Illustrated in Burckhardt, *op. cit.*, p. 204.

16. Illustrated in Anthony Blunt, *Art and Architecture in France: 1500 to 1700* (London and Baltimore, 1953), Pl. 4.

17. For the first time since the coming of the Renaissance, since it had existed in ribs in the early fourteenth century in England and in the late fifteenth and early sixteenth century in Germany.

FERGUSSON AND GARBETT IN AMERICAN ARCHITECTURAL THEORY

ROBERT W. WINTER

IN DISCUSSIONS of European influences on American architectural theory, one rarely encounters the names of James Fergusson and Edward Lacy Garbett. John Ruskin has long been recognized for his contributions to the rhetoric and to the substance of American theory. His idealization of Gothic architecture and his view of architecture as essentially a system of morality are so clearly reflected in American writing that it has usually been assumed that he had a virtual monopoly on theory. Sometimes, though to an insufficient degree, this apparent monopoly is broken by appreciations of A. N. W. Pugin, William Morris, Eugene-Emmanuel Viollet-le-Duc and Charles Eastlake. But Fergusson and Garbett have not shared in this small recognition. While it would be folly to overstate the importance of these British writers, there is considerable evidence that they need to be rescued from oblivion, for their thought, reflecting a progressivism alien to Ruskin, was significant in the intellectual history of American architecture.

Of the two, Garbett is by far the more obscure. The editors of the *Dictionary of National Biography* did not consider him important enough to enroll him with the other writers of miscellany who were discussed in their mighty volumes. *The Library of Congress*, which normally solves the scholar's problems by giving the years of birth and death of the authors in its catalogue, has been unable to gather the basic information on Garbett's life.

On the word of Ruskin, who must have known, Garbett was an architect.[1] The sophisticated knowledge of architecture which he displayed in his *Rudimentary Treatise on the Principles of Design in Architecture*[2] would seem to support this attribution. Yet until the recent publication of Edward Robert De Zurko's *Origins of Functionalist Theory*, no treatment of English architectural history gave Garbett any recognition whatsoever,[3] perhaps because his mind ranged into other fields, particularly theological, out of which emerged one volume with the engaging title, *Finite Avarice: A Socialism Drawn from the Genesis Trade Union Law* (Gen., XLVII, 24). Except for bibliographical details Garbett's life remains a mystery.

James Fergusson (1808–1886) is well discussed in the *Dictionary of National Biography*. The son of a member of the Calcutta merchant firm of Fairlee, Fergusson and Company, he early became interested in India, first as a business-man and then as a student of its culture. After establishing a moderate fortune in the indigo trade, he was able to return to his native Scotland to study and to write upon architecture, mainly that of India which he knew from personal research. But Fergusson was not content to pioneer in Indian studies. He also wrote works on Gothic architecture, on the architecture of Ninevah, Jerusalem and Southern Italy and made contributions to the science of fortress architecture which won wide recognition. His theories on the lighting of the Parthenon were carried out in the building of one of the galleries at Kew. In the early eighteen-seventies, after a short and unhappy career in the British government as Inspector of Public Buildings and Monuments, he retired to his studies and finally a vice-presidency in the Royal Asiatic Society.[4]

The great scholarly achievement of his life was his four-volume *History of Architecture in All Countries from the Earliest Times to the Present Day*,[5] an extension of his earlier book, *The Illustrated Handbook of Architecture*.[6] The *History* was the only book on which he realized a financial profit and is the basis of his small fame in architectural history. Yet the theory of architecture which it reflects was first set forth by Fergusson in an extremely rare volume called *An Historical Inquiry into the True Principles of Beauty in Art, More Especially with Reference to Architecture*.[7]

Although the *Historical Inquiry* went into great detail, the simplicity of its general theme strikes the reader who is interested in the progressivist tendencies in modern architecture. Fergusson subscribed absolutely to the full implications for architecture of the Romantic theory of a progressive universe. While most theorists accepted a part of this progressivism in arguing that architects who imitated the styles of the past were interfering with the natural evolution of building but at the same time insisted that the architects must not go too fast, Fergusson wrote that the sole consideration of the architect should be to reflect the necessities and advances of nineteenth-century man in suitable buildings, let the style take care of itself. Indeed, the

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radicalism of the *Historical Inquiry* must have shocked the few readers who took it up in Fergusson's lifetime. Architecture was, Fergusson wrote, dying if not dead for it was bogged down in a worship of the past. Naturally he was interested in its resurrection. Why not take a lesson from the vital science of engineering and destroy ancient forms when they no longer meet modern requirements? When London Bridge had become outmoded the engineers had torn it down and replaced it with a structure better adapted to modern needs. Yet, Fergusson noted, the architectural profession, mired in reverence for the past, showed no such spirit when looking at the similar problem of church architecture. If architecture were really alive, he maintained, builders would not imitate medieval forms. Indeed, they would even tear down Westminster Abbey and erect a more suitable structure in its place. They would take a lesson from the Middle Ages when people "exulted in their progress and were full of hope," when old structures were wrecked in order to make way for the more magnificent new ones.[8]

This same note of progressivism was sounded by Edward Lacy Garbett. The publication of Fergusson's *Historical Inquiry* and of Ruskin's *Seven Lamps of Architecture* in the same year (1849) seems to have caused Garbett to seek an outlet for his own architectural theory. In 1850 he published his *Rudimentary Treatise on the Principles of Design in Architecture* in which he frequently used both Fergusson's and Ruskin's works as points of departure for his own ideas.[9] Yet Garbett went beyond Fergusson and Ruskin in his suggestion of a program for the future. In the usual Romantic manner he went to the styles of the past for suggestions of the inherent principles of architecture, and he found what he desired. The best styles, he reasoned, had always been a refinement of construction. The unity of Greek temples and Gothic cathedrals was the result of the perfection in them of particular systems of structure. The Greeks, using the post and lintel, embodied vertical and horizontal pressures in a balanced and unified form. Gothic architects drew upon the compressile characteristics of the arch and from their experiments developed the integrated structure and form of the cathedral.[10]

Garbett's ideas did not end with these appreciations of past styles. Like Ruskin, he found a moral in the styles. But unlike Ruskin, his moral was progressive in its implications. The great styles, he wrote, flowered in their time and place because they were embodiments of the most advanced structural principles, but these are out of date in the nineteenth century. "We can," he said, "admire the fading vestiges of their loveliness, but can *never* revive them." The modern principle of construction, Garbett insisted, is the truss or "tensile" method which to a certain extent combines the advantages of the Greek and Gothic systems and yet avoids their defects. "All its *active* pressures are vertical, as in the *first* style; and yet it avoids all cross-strain, like the *second*. It saves all the waste of the material (not conducive to strength) in the lintels of the former style, and, also, *all* the material of the *buttresses* in the latter." Buildings held in tension by wooden or iron bars are therefore "the destined architecture of the future."[11]

This theme of the esthetics of construction with its progressivist overtones reflects the nineteenth-century concern for a movement away from the superficialities of ornament, for an esthetic more deeply based on structure and purpose. Garbett seems to have realized the radical nature of his position. He proceeded to attack the very source of the view that architecture *is* ornament. John Ruskin, he said, had committed the error of "mistaking ornament for beauty" in architecture.[12] To him architecture was but a beautiful skin. James Fergusson also erred, Garbett felt, in limiting his application of the term beauty to only the very highest forms of architecture, such as the Parthenon.[13] Both authors fell into error, Garbett suggested, because they considered the structure of a building to be a mere framework to which the higher arts—painting and sculpture—must be attached before beauty can be attained. They neglected the expressive qualities inherent in wise organization and sound structure. Beautiful architecture is still beautiful even when it is stripped of its ornament, he insisted. Although ornament certainly heightens the expressive qualities of a building and thus adds to beauty, no building can be beautiful which does not begin with beautiful construction.[14]

The reaction of Ruskin and Fergusson to this attack on their logic is both interesting and amusing. Ruskin, never one to tolerate criticisms of his theories, lashed out at Garbett, who, he wrote, being a mere architect was in the habit of thinking of ornament as being "pinned on" structure. Ruskin's own view was (according to Ruskin) quite different. Beautiful architecture, he insisted, in the true vein of Romantic orthodoxy, is organic. The ornament is integral with the structure, the parts are related to the whole. To isolate the two is absurdity. "And I use the words ornament and beauty interchangeably," he continued, "in order that architects may understand this: I assume that their building is to be a perfect creature capable of nothing less than it has and needing nothing more."[15]

Fergusson was not so pointed as Ruskin in his counterattack. Indeed, he did not even say that he had read Garbett's work. Yet there is internal evidence in his *Illustrated Handbook* (1855) that he had read Garbett carefully and completely digested his theory. He rather pointedly called attention to one building of real beauty—the town hall at Louvain—whose beauty is *entirely* dependent upon its ornamentation which if stripped from the framework would leave but a shell, "little better than a factory."[16] This observation seems clearly aimed in Garbett's direction. Yet it would appear that Fergusson decided to compromise with Garbett. While there are, he noted, isolated

instances of beauty being the result of ornament and ornament alone, it usually derives from adherence to the principles of structure. Fergusson believed that the Greek and Gothic architects had observed this rule in their greatest buildings and thus had achieved organic unity. Like Ruskin, whose *Seven Lamps* may have suggested the image to him, Fergusson saw the cathedral as, in a sense, a natural organism. So integrated were its parts, so nice its interrelationships, that just as Cuvier or Owen might reconstruct the skeleton and living habits of an extinct species with only a shred of bone or a footprint to work from, "an architect may from a few fragments of a building, if of a true style of architecture, restore the whole of its pristine forms, and with almost the same amount of certainty." The ancient architects working in the best styles "added nothing which was not essential; there was no detail which had not its use, and no ornament which had not an elaboration or heightening of some essential part, and hence it is that a true building is as like to a work of Nature as any production of man's hands can be to the creations of his Maker." [17]

Yet Fergusson's progressivism took him beyond this Romantic commonplace. As in his earlier *Historical Inquiry*, he admired the discipline of engineering and found it a model for art. But in the introduction to the *Illustrated Handbook* he cited important examples of engineering which helped to prove his thesis. As Horatio Greenough had done a little earlier and Viollet-le-Duc was to do somewhat later, Fergusson found the epitome of organic unity in shipbuilding. "In the ship," he wrote, "the most suitable materials only are employed in every part, and neither below nor aloft is there one single timber nor spar nor one rope which is superfluous." [18]

Fergusson also admired the warehouse buildings which were being erected in Manchester and other cities in the north of England. "They were," he observed, "designed wholly with reference to their uses, and ornamented only in their construction." [19] But he saved his greatest hymn of praise for the Crystal Palace constructed for the Exposition of 1851: "In the confusion of ideas and styles which now prevails," he wrote, "it is satisfactory to be able to contemplate . . . at least one great building carried out wholly in the principle of Gothic or of any true style of art. No material is used in it which is not best for its purpose, no constructive expedient employed which was not absolutely essential, and it depends wholly for its effect on the arrangement of its parts and the display of its construction." [20]

Fergusson did not accept Garbett's criticisms so wholeheartedly as to place these utilitarian structures within his definition of architecture. He was quite clear that these buildings were too ephemeral to be considered the highest art. Architecture was for him clearly palaces and temples. Yet these structures, along with sailing ships, were examples of the method which might regenerate modern architecture. "If a hundred experiments in Crystal Palaces were to be made, each one profiting from the previous experiment, men might," Fergusson believed, "learn to despise many things we now servilely copy, and might create a style surpassing anything that ever went before." [21]

Both Fergusson and Garbett were, in spite of Garbett's rather forced distinctions, arguing essentially the same theme: that a building develops from within, from its purpose and structure, yet that it is more than the satisfaction of the demands of structure and utility. For both of them architecture was an art of the imagination, of individual creativity. Ornament was for both a means of achieving a high art. Yet both were sure that ornament could not be borrowed from the styles of the past. It is true that Fergusson suggested that a modern style might develop from a modification of Italian Renaissance architecture, but he made it quite clear that he had serious misgivings on that subject.[22] Both men believed that the modern civilization deserved expression in a new, characteristic architecture. The optimism of their view of the prospects of architecture offers a strong contrast to the rather melancholy pronouncements of John Ruskin, who was far more famous than Fergusson and Garbett in both England and America. It was far more in the spirit of nineteenth-century architectural theory in America than the fatalism of the more often quoted Ruskin. When they were mentioned in American writing, it was always to emphasize the progressivist view of architecture and to argue reform.

The bridge between the thought of Garbett and that of his first convert in America, Ralph Waldo Emerson, was a solid one. Oddly enough, it was the Englishman who first noticed and appreciated the correspondence of their ideas. Early in the *Rudimentary Treatise*, when he was trying to find the reason for the ugliness of modern architecture, Garbett discovered the key in Emerson's essay, "Art," in the passage in which Emerson wrote of "the selfish and even cruel aspect which belongs to our great mechanical works." [23] This recognition may have called Emerson's attention to Garbett for he was soon writing to Horatio Greenough, the Boston sculptor and architectural theorist, about Garbett's merit. Emerson had, at the time, an enormous admiration for Ruskin, but he wrote that although Garbett was "Ruskin's scholar," he found "the pupil a better teacher than the master." [24] In 1868, in a lecture on "Nature and Art" Emerson placed Garbett's writings alongside those of Ruskin, Winckelmann, Goethe, Bell, Penrose and Viollet-le-Duc as "joyful possessions which no man could forego, and which we rank close beside the disclosures of natural history." [25] Evidently referring to Garbett's contribution to Edward Dobson's *Students' Guide*, Emerson thanked his future biographer, James Elliot Cabot, for lending him "this fine book of

Garbett's supervision and interweaving of his golden threads." [26] It is true that in a later letter Emerson felt that Garbett had "lost his head" in making certain accusations against some of the actions parliament had taken regarding ecclesiastical buildings, but he added that it was a "rare" head.[27]

Like Garbett, Emerson found nature to be the architect's best teacher, and nature taught him the same lesson. Nature was economical in her creation of organisms, in her severe adaptation of means to ends. She was purposeful, and above all honest. "The plumage of the bird, the mimic plumage of the insect," he wrote, "has a reason for its rich colors in the constitution of the creature. The powers of each animal are predicted in the skeleton." In order that the architect may build his Vaticans "in fit continuation of the architecture of the Andes," he must see this relationship between form and function and exclude from his buildings every unnecessary detail, every unmeaning ornament.[28] Emerson saw in both the Greek temple and the American barn the beauty in solid construction which "just meets the want, you can leave nothing out, you can put nothing in." [29] Indeed, his call for economy, "the science of omitting," [30] sometimes led him to a most Spartan esthetic. A study of natural method and art objects, he suggested in his essay on "Beauty," teaches

> that outside embellishment is deformity. . . . Hence our taste in building rejects paint, and all shifts, and shows the original grain of the wood: refuses pilasters and columns that support nothing, and allows the real supporters of the house honestly to show themselves. Every necessary or organic action pleases the beholder.[31]

Although the organicism contained in these passages appears closer to that of Fergusson than of Garbett, Emerson quoted the latter more often. In admiring Gothic architecture for its "rigid economy of material," he quoted Garbett's remark that "the whole decorative system [of Gothic architecture] consisted in removing superfluous matter not conducive to strength." [32] Like Garbett, he was fascinated by the science of engineering which adhered in its designs to the specific requirements of the problem and the nature of the materials to be used in its solution. In a lecture in 1868 he quoted Garbett's observation that "perhaps the equilibrium of some of the boldest vaultings was inspired by experiments in systems of chains representing the ribs inverted" and illustrated his notes with diagrams inspired by a design in a footnote to Garbett's *Rudimentary Treatise*.[33]

The correspondence between Emerson's ideas on imitation and those of Garbett is also striking. His observation in an early lecture on "Art" (1836) that the creative impulse "is impatient of counterfeits and things not alive" [34] was marvelously corroborated by Garbett's belief that "the thing we copy is in the old work, a member: but the same form copied, as we copy it, is no longer an ornamental member, but simply an ornament, therefore an imitation of a human work as ornament, and therefore base, if you accept the above rule." [35] Indeed, in speaking of the same subject in 1859 Emerson found this comment by Garbett very much worth quoting.[36]

Emerson's use of Fergusson's works is less significant, yet interesting. In 1868, as he was re-reading Horatio Greenough's thoughts on architecture in *The Travels, Observations and Experience of a Yankee Stonecutter* (1852), he remarked parenthetically in his journal, "Where is Fergusson's handbook?" and later "Where's Fergusson again?" [37] He seems mainly to have drawn on Fergusson for historical and technical information, but he hardly could have missed the progressivist message in the introduction to the *Handbook*.

If Emerson did not use Fergusson as heavily as he might have, there were other American theorists who did. In 1864, A. W. Colgate, a critic writing in the *Continental Monthly*, admired the structural "honesty" of the suspension bridge built by John Augustus Roebling at Niagara Falls in 1854 and this iron marvel soon led him to an admiration *à la* Fergusson of the Crystal Palace at Sydenham which he found to be "in iron what Gothic is in stone." [38] With obvious relish he quoted Fergusson's appreciation of Paxton's great greenhouse in which "no material is used . . . which is not best for its purpose, no constructive expedient employed which was not absolutely necessary, and [which] depends wholly for its effect on the arrangement of its parts and the display of its construction." [39] Sometimes American architectural critics were not so careful to acknowledge their use of Fergusson. In 1894 the famous architectural critic, Montgomery Schuyler, was stressing the necessity for organic order in architecture, for economy of means. Just as Cuvier could reconstruct the whole bone structure of an animal with but a single bone to work from, he wrote in the *Architectural Record*, "a person sufficiently skilled in the laws of organic structure can reconstruct from the cross-section of the pier of a Gothic cathedral, the whole structural system of which it is the nucleus and prefigurement." [40] Schuyler did not credit Fergusson's *History*, I, 43, for this analogy of art to nature, but by this time we may assume that the idea was so firmly in the public domain that such scholarly diligence seemed unnecessary.

The concern in American theory for deriving esthetic effect from structure before considering details was felt by a rather obscure figure in American theory, Alexander F. Oakey, an architect whose houses, designed in the Queen Anne or "shingle style," were erected on the eastern seaboard in the eighteen-seventies and eighties.[41] A study of past architecture showed Oakey, who was a Darwinist as well as an architect, that the styles had evolved as new principles of construction and new social purposes had developed. Where had he been made aware of this truth?

Why, in Fergusson's *History*, of course! "I cannot read his history," Oakey remarked, "without being struck by the completeness of the evolution its pages record: there is no missing link in the work of nature, for I must believe architecture is the expression of longings and aspirations of physical and intellectual man, the work of nature as actually as any thing Mr. Huxley can enlighten us upon." This history, Oakey continued, impresses the reader with the subtle variations in form which changes of climate, custom and political activities have caused in architecture-variations which "were as naturally consequent as the changes in structure and exuberance of a vegetable when transplanted, or by treatment brought to a state of cultivation." Does not the history of architecture up to the fifteenth century suggest that, as in the plant, the inherent qualities of building must be cultivated if the flower is not to wither and die? [42]

Fergusson's *History* was a revelation to Oakey. But he noted that for all the fertility of Fergusson's thought he had finally asked for a return to Renaissance architecture, a revivalism which contradicted all his principles.[43]

Fergusson having failed him, Oakey looked for purer thought and found it in the writing of Edward Lacy Garbett. He believed that Garbett had shown conclusively that the expressive qualities of masonry construction had in the nineteenth century been exhausted and that the modern program for architecture must be derived from the principle of "tensile" construction in order that in the plan of evolution modern buildings might become "forever stepping-stones for future generations in search—not of a new style, but truth." [44]

Truthful architecture for Oakey was architecture whose form developed from within. "If a building is founded upon the best plan for its purpose," he wrote, "its exterior and interior follow as a matter of course, either intimating the other's dispositions, and explaining them; the detail being confined to the explanation of parts, and being in some instances phonetic." [45] Functional requirements, building materials and structural processes are, he said, "the parents of all possible design." [46] Yet even in his theory Oakey was, like Garbett, no narrow functionalist. Architecture was for him more than mechanical order. He believed that it began as a mechanical process but ended as a creation of the architect's imagination. While a useful building may be developed from a dedication to the purpose intended, it does not follow, he insisted, that it will be a beautiful building. Beauty comes from an intuitive grasp of the elements of design and of constant revision of the ground plan to meet esthetic demands. Yet the "truth" to function must be apparent even down to the decoration which "should be functional aesthetically; that is, its use should be to emphasize the natural expression of the work." [47]

For Oakey, as for Fergusson and Garbett, architecture was something more than an exhibition of construction and purpose. He made a place for imagination and even "functional" ornament in his esthetic. Yet, having like them a preoccupation with the modern science of engineering, he stressed that aspect of design which is constantly eliminating the unessential, which trims and *discards*. Imagination and ornament are subordinated in this view to construction and purpose.

Although no man will probably ever dare to oppose imagination, his attitude toward the future of ornament cannot be predicted with such certainty. Indeed, it is only a short step from Oakey's view of architecture as an economical process to an argument that ornament, at least in the conventional sense of sculpture and painting, may be entirely eliminated from buildings. This was a step which Oakey never took, but as we have seen in the case of Emerson, it was a step which was occasionally taken in the nineteenth century. An emphasis on economy, on the paring away of details, may force architecture into an esthetic of scarcity. Emerson's friend, Horatio Greenough, who sculptured George Washington stripped to the waist, wrote in this case of architecture, "In nakedness I behold the majesty of the essential, instead of the trappings of pretension." [48] Almost forty years later Louis Sullivan suggested (in strong contradiction of his architectural practice) that "it would be greatly for our esthetic good if we should refrain entirely from the use of ornament for a period of years, in order that our thought might concentrate more acutely upon the production of buildings well-formed and comely in the nude." [49] The direction of this kind of thought was clearly toward the elimination of ornament from the façades of buildings. Needless to say, this was the path which the more advanced architecture, both European and American, was eventually to take.

It was toward this esthetic of scarcity that both Fergusson and Garbett, despite their interest in ornament, were pointing. They heralded in their ideas the development of the glass towers which are now being constructed in our cities and by which, ironically, Fergusson and Garbett would undoubtedly have been puzzled and dismayed. In their emphasis on the economical aspect of the organic principle, an idea as old as Plato and probably older, and their admiration of the embodiment of economy in ships and buildings they encouraged the movement toward modern asceticism, purity, classicism. Whatever one may think of this movement (and the writer is not an extravagant admirer of either the esthetic of scarcity or its material results) Fergusson and Garbett must be recognized as grandfathers of the new order.

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1. John Ruskin, *The Stones of Venice* (New York, 1865), I, 433–434.

2. (London, 1850). Garbett also wrote some notes on design for Edward Dobson's, *The Students' Guide to the Practice of Measuring and Valuing Artificers' Works* (London, 1852–1853).

3. In his *Early Victorian Architecture in Britain* (New Haven, 1954), I, 13, Henry-Russell Hitchcock mentions an Edward Lacey Garbett who was the architect of a church at Theale in Berkshire, but this is not the Garbett who wrote the *Rudimentary Treatise*. See H. M. Colvin, *A Biographical Dictionary of English Architects, 1660–1840* (London, 1954), p. 224. De Zurko, in his account of Garbetts ideas in *Origins of Functionalist Theory* (New York, 1957), pp. 140–144, is not interested in Garbett's biography.

4. See article on Fergusson by G. W. Burnett in *DNB*.

5. (London, 1862–67).

6. (London, 1855).

7. (London, 1849).

8. *Historical Inquiry*, p. 149. A much broader treatment of the ideas of Fergusson and Garbett will be found in De Zurko, *op. cit.*, pp. 140–148.

9. See especially *Treatise*, pp. 9, 12, 18–19, 101, 124–125.

10. *Ibid.*, pp. 132–134.

11. *Ibid.*, p. 135.

12. *Ibid.*, p. 12.

13. *Ibid.*, p. 20.

14. *Ibid.*, pp. 14–16.

15. John Ruskin, *The Stones of Venice* (New York, 1865), I, 433–434. It seems to me that Ruskin scored a point in logic here. Yet Garbett was correct in noting Ruskin's habitual identification of ornament and beauty.

16. *Illustrated Handbook* (2nd ed.; London, 1859), p. xxviii.

17. *Ibid.*, p. lii.

18. *Ibid.*, p. liv.

19. *Ibid.*, p. lvi.

20. *Ibid.*

21. *Ibid.*, p. lvii.

22. *Ibid.*, p. lvi.

23. Garbett, *Treatise*, p. 5, quoted from "Art," *The Complete Works of Ralph Waldo Emerson*, ed. Edward Waldo Emerson (Centenary Edition; Boston and New York, 1903–1904), II, 368.

24. Emerson to Horatio Greenough, January 7, 1852. *The Letters of Ralph Waldo Emerson*, ed. Ralph L. Rusk (New York, 1939), IV, 272.

25. Emerson, MS Lecture, "Nature and Art" (1868) Emerson Papers in the Houghton Library at Harvard University. I am grateful to Mr. Edward W. Forbes for the permission of the Ralph Waldo Emerson Memorial Association to publish material from these papers.

26. Emerson to James Elliot Cabot, January 14, 1871. Emerson, *Letters*, ed. Rusk, VI, 143. He also mentions a letter from Garbett which seems to have been lost.

27. Emerson to James Elliot Cabot, June 26, 1871. Emerson, *Letters*, ed. Rusk, VI. 165.

28. Emerson, MS Lecture, "Nature and Art" (1868).

29. Emerson, MS Lecture, "Genius, Imagination Taste" (1866), p. 19.

30. Emerson, "Art and Criticism," *Works*, XII, 290.

31. Emerson, "Beauty," *Works*, VI, 290–291.

32. Emerson, MS Lecture, "Beauty in Art" (1859), quoted from Garbett, *Treatise*, p. 240.

33. Emerson, MS Lecture, "Nature and Art" (1868), based on Garbett, *Treatise*, p. 191 n.

34. Emerson, MS Lecture, "Art" (1836).

35. Emerson puts quotation marks around this line in his MS Lecture, "Beauty in Art" (1859). I have been unable to find this quotation in the *Treatise*, though Emerson may have been paraphrasing a passage on p. 130.

36. Emerson, MS Lecture, "Beauty in Art."

37. Emerson, MS Journal NY (1868), pp. 95–96.

38. A. W. Colgate, "The Development of American Architecture," *Continental Monthly*, V (April, 1864), 476.

39. *Ibid.* Quoted from Fergusson, *History of Architecture*, I, 48.

40. Montgomery Schuyler, "Modern Architecture," *Architectural Record*, IV (July–September, 1894), 11.

41. See Vincent Scully, Jr., *The Shingle Style* (New Haven, 1955), pp. 18, 54–55, 61, 71–77, and also plates 19, 21, 31, 32, 33. I have been unable to find biographical details on Oakey.

42. Alexander F. Oakey, "The Possibility of a New Style in Architecture," *American Architect and Building News*, III (January 19, 1878), 22.

43. Oakey was referring here to a comment in Fergusson's *History*, I, 47–48. His attack on Fergusson is too severe. The context of Fergusson's remarks shows that he had serious doubts about the success of an Italian Renaissance revival.

44. Oakey, "New Style" *American Architect*, III, 22.

45. Oakey, "Architect and Client," *American Architect*, I (August 26, 1876), 277.

46. Oakey, "A Word to the Wise," *The Overland Monthly*, XVIII (2nd series, August, 1891), 135.

47. Oakey, "Architect and Client," *American Architect*, I, 277.

48. "Relative and Independent Beauty," *Form and Function*, ed. Harold A. Small (Berkeley and Los Angeles, 1947), p. 75.

49. "Ornament in Architecture" (1892), *Kindergarten Chats (Revised 1918) and Other Writings*, ed. Isabella Athey (New York, 1947), p. 187.

AMERICAN NOTES

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NEW ALBION (Continued)

We recently published in this department some three-centuries-old hints for housing at the projected settlement of New Albion, in what is now New Jersey. Of the six types of dwellings listed, Type I, the simplest, was of barked poles "like an Arbour" covered with the bark of pine or fir trees. This was an expedient to be erected during the first fifteen days while the new settler was still sleeping and eating aboard ship. (Incidentally, please read "1638" for "1738" in paragraph 3, line 6). The house of Plantagenet's description is discussed below in its relationship to that of the coastal aborigines by Mr. Lindsay, SAH, Associate Curator, Division of Cultural History, The Smithsonian Institution, and is published by permission of the Secretary of that establishment.

PLANTAGENET'S WIGWAM

By C. CARROLL LINDSAY

The American Notes of the October, 1956, *SAH* JOURNAL add another chapter to the long and mysterious history of Beauchamp Plantagenet's *A Description of the Province of New Albion.* The identity of the author and the veracity of his work have puzzled historians for quite a long time. As early as 1840, one John Pennington published *An Examination of Beauchamp Plantagenet's Description of New Albion.* Pennington (page 19) concluded that, "This tract has now, it is presumed, been sufficiently analysed to show that it is not an authentic document, although it has been so regarded at different periods by historical writers of various merit. . . ." Subsequent scholarship supports Pennington's assertion that the name Beaumont Plantagenet is no more than a fancy pseudonym.[1] The true identity of the author, however, remains unknown.

Pennington's belief that much of the tract was some sort of fiction, or at best pirated from one or more contemporary descriptions of the colonies, seems open to question. True, Pennington pointed out a great many remarkable discrepancies in the tract, "2,000 Indians armed with guns at page 17 are reduced to 800 naked and unarmed at page 20, but then at page 22 the 'naturals' rally in great force, for nearly 3,000 are mustered and told off . . .," to mention but one example. Such discrepancies, and there are indeed many, occur mainly however, when the mysterious author deals with the history of the English settlements. Those portions of the work which discuss conditions and events nearer the date of publication (1648) appear at least to adhere more closely to actual fact. Perhaps the clearest proof of this is found in the description of the "six sorts" of houses quoted in the American Notes of October, 1956. It seems most unlikely that Plantagenet, whoever he may have been, conjured a description of a log cabin out of the blue. Since no other similarly early printed notice of log building in the colonies has been turned up, at least this portion of the *Description of New Albion* was prepared either from first hand knowledge or intimate association with someone thoroughly acquainted with the Delaware Valley in the middle of the seventeenth century.

Of the houses noted, the first "sort" or the wigwam type receives the most lengthy description. Exactly why this particular shelter appealed so strongly to Plantagenet is not explained. If he realized that the bark wigwam was of Indian derivation, he does not say so. However, Indian shelters of this nature had been described in several early seventeenth-century travel accounts and engravings of them appeared as early as 1590 in Thomas Hariot's *A Brief and True Report of the New Found Land of Virginia.* The famous de Bry engravings for this work were adapted from watercolors done by John White while visiting the New World about 1585. While the de Bry plates vary considerably from the White watercolors, the wigwams in the work of both artists remain basically the same.[3] Both appear to agree with the written descriptions in other travel accounts.

The Indian wigwam attracted the attention of a host of early travellers and explorers. Between 1524 and 1705 at least fifteen authors described these shelters in some detail.[4] The appearance of Indian bark wigwams from North Carolina to Maine was recorded in this 180-year period. None of the descriptions is markedly different from any other except that as the seventeenth century wore on the Indian is seen to have adopted the nail to facilitate his wigwam construction.[5]

William Strachey, travelling in Virginia about 1607, observed that, "As for their [the Indian] houses, who knoweth one of them knoweth them all, even the chief king's house itself, for they be all alike builded one to the other."[6] Samuel Hopkins, writing in the middle of the eighteenth century, left one of the better contemporary accounts of these wigwams.

> A wigwam is an Indian house, in building of which they take small flexible poles and stick them into the ground, round such a space as they intend for the bigness of their house, whether greater or less: those poles they bend from each side, and fasten them together, making an arch over head: Then they fasten small sticks to them cutting the poles at right angles, which serve for ribs, after which they cover the whole with the bark of trees, leaving a hole at the top for the smoke to go out, and at one or both ends to go in and out.[7]

Though Hopkins wrote a bit more than a hundred years after Plantagenet, and almost 150 years after Strachey, the Indian wigwam remained unchanged.

The Plantagenet wigwam dimensions (25′ x 18′ x 12′) indicate no remarkable divergence from the aboriginal pattern. The Indian wigwam builders worked without restraint in the size of their building. The only rule guiding the red men in this matter was succinctly recorded by Hopkins, namely, "such a space as they intend for the bigness of their house, whether greater or less. . . ." Verrazzano in 1524 saw wigwams "ten or twelve paces incompass."[8] In 1680 Jasper Dankerts wrote that "Their [the Indian] house was low and long, about sixty feet long and fourteen or fifteen feet wide."[9] Daniel Gookin, observing near Cambridge, Massachusetts, in 1674 wrote, "The houses they make of several sizes, according to their activity and ability, some twenty, some forty feet long and broad."[10]

Having directed the erection of the usual bent sapling framework of the desired size, Plantagenet's next instruction deals with the covering of this arbour-like structure. He says, "Now they fell pine or fir trees, and cut off the bark boards, 9 foot long and 6 foot broad, being an inch thick, white and sweet of the turpentine." No conclusive evidence appears to directly contradict the statement that the bark was nine feet long and six broad. Daniel Gookin says only that the bark is "slipped from their bodies [the trunks of trees] at such time as the sap is up; and made into great flakes with pressures of weighty timbers, when they are green. . . ." Van der Donck, in his *A Description of the New Netherlands*, wrote of the Algonquian wigwams, "For covering they use the bark of ash, chestnut, and other trees, which they peel off in pieces about six feet long and as broad as they can."[11]

John Bartram's talent for keen scientific observation was responsible for an extraordinarily detailed account of the Iroquois Indian process for obtaining wigwam bark. "They cut the tree round through the bark near the root, and make the like incision about seven feet above it, there horizontal ones are joined by a perpendicular cut, on each side of which they after loosen the bark from the wood, and hewing a pole at the small end gradually tapering like a wedge about two feet, they force it in till they have completed the separation all round, and the bark parts whole from the tree, one of which a foot in diameter, yields a piece seven feet long and above three feet wide."[12]

Nevertheless, strips or sheets of bark of such great size as Plantagenet mentions were probably not available to the Indians. Strachey found a definite shortage of bark among the savages. He wrote, "The walls are made of barks of trees, but then these be principal houses, for so many barks which go to the making up of a house are a long time purchasing."[13] Whether the shortage was due to a limited supply of bark or the difficulty of removing it from the trees, Strachey does not reveal. If the latter, the colonists with their European tools and techniques enjoyed an advantage over the Indian in this matter.

In any event, neither the written descriptions of the Indian wigwams nor the contemporary pictorial representations of them indicate the use of bark sheets six by nine feet in size. John White's watercolors show wigwams covered with pieces of material perhaps three feet wide and about five feet long.[14] The material cannot, however, be distinguished as bark sheets or the equally prevalent woven mats which were also used for covering wigwams.[15] It should be noted that white pine trees frequently attain a size which would readily provide six by nine foot bark sheets. Balsam fir, which is not now native to the east coast of the United States much south of New York City, may possibly have occurred in New Jersey in the seventeenth century. Balsam fir is not known to grow more than thirty inches in diameter and seldom reaches a diameter of twenty inches.[16] Exactly what kind of trees Plantagenet called pine and fir cannot be determined with certainty because of the wide variety of such species.

After giving the size of the bark sheets, Plantagenet proceeds with his directions for attaching them to the arched framework: "On the *inside* [italics supplied] then they place the bark boards between the poles, and one hanging over the other a full inch thick. . . ." If, as this suggests, the poles were really covered on the inside, the practice was completely at variance with the established Indian custom. It would seem also to be at variance with any logical construction or building technique, especially if the simplicity of the structure were an important factor. The double row of arched poles, strengthened with rather evenly spaced horizontal poles, was erected by the Indians simply as a framework upon which to place the bark or woven mat covering. The Indian always placed the covering on the *outside* of the poles. This is clearly evident in the White and de Bry representations and is repeatedly noted in the contemporary written accounts. Of fifteen authors who saw Indian wigwams, eleven use the word "cover" to describe the process of attaching the bark or mat to the pole framework.[17] Two writers, Strachey in 1607, and Père Baird in 1616, use the verb "throw" in telling how the covering was placed on the frame.[18] One source, *Mourt's Relation . . .*, found that, "The houses were double matted, for as they were matted without, so were they within, with newer and fairer matts. . . ."[19]

An interior view of a wigwam is found on "The Map of Old Virginia with the Figures of the Savages" in Captain John Smith's *The General History of Virginia*. In the scene on the map entitled "King Powhatan commands C. Smith to be Slayne. . . .," Smith lies on the floor of the wigwam surrounded by savages about to club him to death. All the framework of the structure is clearly visible. It is obvious in this view that the frame was covered on the outside, not the inside.[20]

The use of the word "inside" may, however, have a logical explanation. None of the early accounts state with

clarity exactly how the bark siding was attached to the poles, nor do any of the contemporary pictorial representations reveal this detail. Van der Donck does mention that the covering was secured "with withes to the lathings."[21] Norwood, in 1649, saw a wigwam in the Virginia Indian village of Kecoughtan in which "the roof was tied fast to the body [of the wigwam] with a sort of strong rushes that grow here, which supplied the place of nails and pins, mortises and tenons. . . ."[22] Plantagenet directs that "the bark boards [be] fastened with a double ten penny nail through the board, and *both* [italics supplied] poles clinched. . . ."

It has been noted that the framework consisted of two rows of bowed saplings reinforced with horizontal saplings, in a fashion similar, as Plantagenet and others noted, to an arbour. There is no doubt that the Indians covered this frame by attaching bark or mats to the exterior. Quite possibly the bark covering, once placed over the framework, was secured by running a few more saplings on top of the bark. If so, the bark would have been as Plantagenet says "between the poles" and of course "inside" the poles which served to secure the bark to the framework. The English wigwams constructed at Pioneer Village, Salem, Massachusetts, were made in just this way.[23] Evidence that the mat or bark covering was secured with a few extra poles on the outside of the wigwam may be presumed from the survival of this practice among certain American Indians

Interior of Virginia Indian wigwam from Smith, *The Map of Old Virginia With Pictures of The Savages.* (Courtesy The Smithsonian Institution)

Winnebago structures near Green Bay, Michigan, *c.* 1900. The poles laid over the exterior secure the mats to the wigwam frame. (Courtesy The Smithsonian Institution)

as late as the early twentieth century. Photographs of Ojibway wigwams in the area around Mille Lacs, Minnesota about 1900, show pieces of bark and matting weighted or held down with the aid of long poles. These were placed irregularly about the exterior of the wigwam.[24] An old but undated photograph of an Iowa Indian wigwam shows even more clearly this use of extra poles to secure the bark.[25]

If the colonists adopted this means of attaching the bark to the frame, then the meaning of Plantagenet's statement becomes clear, and agrees (except for the use of the nail) with the usual Indian practice. A nail driven through the securing pole could pass through the bark sheet, penetrate the frame pole and be clinched. Since the bent saplings as well as the bark were of necessity green, there was little danger of the large nail splitting either the bark or the poles.

Except for noting the use of clinched ten penny nails the remainder of Plantagenet's description would indicate little change from the aboriginal wigwam. Oddly enough, no mention is made of any heating arrangement. It has been supposed, though little in the way of proof seems available to support the theory, that the English wigwam was heated by a fireplace. The Indian, ignorant of such refinement, contented himself with an open fire on the floor and left a hole in the roof through which the smoke might perchance escape. Colonel Norwood's experience with the Indian heating arrangement would seem a fair gauge of the success of the open fire: "The space in the middle was the chimney, which had a hole in the roof over it, to receive as much of the smoke as would naturally repair to it; the rest we shared amongst us, which was the greater part. . . ."[26]

Plantagenet gives the cost of one of his wigwams as ten shillings. This figure would hardly allow for the erection of a well laid masonry chimney. Even a wood and mud or "catted" chimney of the variety common in the early Massachusetts settlements would have stretched

Plantagenet's ten shilling budget to the breaking point.[27]

Plantagenet's wigwam was of two rooms. Indian dwellings of similar size (18 x 25) probably were not divided into rooms. Van der Donck found that the Indians "know nothing of chambers, halls and closetings."[28] The Long House of the Iroquois was divided into a number of small rooms or cubicles. However, the Long House, though constructed in the same manner as the more common and smaller wigwam of the Eastern Woodland Indians, was often 100 or more feet in length. Of the Virginia Indians at the beginning of the seventeenth century, Strachey says, "They eat, sleep, and dress their meat all under one roof, and in one chamber, as it were."[29] The division of the English wigwam into rooms appears then to demonstrate no particular Indian influence, but instead, the tendency of the settlers to adapt their own experience to a new condition.

Except for the use of nails in attaching the bark and the division into rooms, Plantagenet mentions no non-Indian refinements in his wigwam. It would seem probable that the more enterprising colonists might have introduced some form of window into the English wigwam. European descriptions and pictorial views reveal no openings in the Indian dwellings except a door at one or both ends and the openings in the top for escape of smoke. Roger Williams, in his *A Key into the Language of America*, published in 1643, reveals the quaint attitude of the Narragansett Indians toward the apertures in their dwellings.

> Most commonly their houses were open, their door is a hanging mat which being lift up, falls down itself; yet many of them get English boards and nails, and make artificial doors and bolts themselves, and others make slighter doors of Birch or Chestnut bark, which they make fast with a cord in the night time, or when they go out of town, and then the last (that makes fast) goes out at the chimney, which is a large opening in the middle of their house called Wunnauchicomock.[30]

The laconic Strachey says of the early Virginia Indians, "windows they have none."[31] Considering the very small cost of the wigwam Plantagenet recommended to the prospective colonist, the absence of windows is hardly more unusual than the lack of a chimney. However, settlers not bound by financial strictures could certainly have added windows, fireplace, and even other niceties such as a wooden floor according to their predilection and pocketbook. It is unlikely, however, that the colonist expended great time and labor on his temporary abode. All such structures had disappeared in Salem, Massachusetts, by 1661, and there is no reason to believe they endured for longer periods elsewhere among English settlements.[32]

Plantagenet's description of the wigwam as adapted by the colonist reveals no major difference from the same shelter as used by the Indians. If the colonists really did attach the bark to the interior of the arbour-like framework, as might be inferred from Plantagenet's vague wording, such a departure from the Indian practice deserves note. However, a wigwam with bark only on the inside confounds the practical (and for this kind of structure, primary) consideration of simple construction. It is more likely that the settlers placed the bark on the exterior of the frame in the Indian manner. Plantagenet's apparent variation of this procedure may doubtless be attributed to his seventeenth-century diction.

If, as the mysterious tract writer would have us believe, shelters of the wigwam type could be had for 10s, they were surely of the meanest sort. For the price of ten days' labor, or a bushel of wheat, or a good man's hat, one was not to be housed in a dwelling that deserved the name.[33]

1. Recent unpublished research by Mr. Clifford D. Lewis, III, (SAH, Philadelphia) also supports this conclusion.
2. Pennington, p. 18.
3. Stefan Lorant, *The New World* (New York, 1946), pp. 190–191, 263, 265.
4. Samuel de Champlain, *Voyages 1604–1618*, in *Original Narratives of Early American History* (New York, 1907), pp. 48, 63.
Père Pierre Baird, *Relation of New France*, in *Jesuit Relations and Allied Documents* (Cleveland, 1897), III, 77.
Jasper Danckaerts and Peter Sluyter, *Journal of a Voyage to New York in 1679–1680*, in *Original Narratives of Early American History* (New York, 1913), p. 55.
Daniel Gookin, *Historical Collections of the Indians of New England*, in *Collections of the Massachusetts Historical Society*, I (Boston, 1806), p. 149.
Francis Higginson, *New Englands Plantation*, in *Force's Tracts* (New York, 1947), I, 13.
Samuel Hopkins, *Historical Memoirs Relating to the Housatunnuk Indians*, quoted in David I. Bushnell, Jr., *Native Villages and Village Sites East of the Mississippi*, Bureau of American Ethnology *Bulletin* 69 (Washington, D.C., 1919), p. 25.
Armand Louis de Lom d'Arce Lahontan, *New Voyages to North America* (London, 1703), II, 6.
George Mourt, *A Relation or Journal of the Beginning and Proceedings of the English Plantation Settled at Plymouth in New England*, in Edward Arber, *The Story of the Pilgrim Fathers . . .* (London, 1897), 422.
Père Sebastian Rasles, *A Letter From . . . to His Brother*, in *Jesuit Relations and Allied Documents* (Cleveland, 1909), LXVII, 135.
Captain John Smith, *The General History of Virginia*, in *Smith's Works* (Arber Edition), p. 362.
Henry Spelman, *Relation to Virginia*, in *Smith's Works* (Arber Edition), p. cvi.
William Strachey, *The History of Travel Into Virginia Britannia*, reprinted by *Hakluyt Society* (London, 1849), p. 70.
Adriaen van der Donck, *A Description of the New Netherlands*, in *Collections of the New York Historical Society*, 2nd Ser., I (1841), p. 196.
John de Verrazzano, *The Relation of . . .*, in *Old South Leaflets*, 7th series, No. 1 (1889), p. 9.
Roger Williams, *A Key into the Language of America*, in *Collections of the Rhode Island Historical Society*, I (1827), p. 51.
5. Williams, *op. cit.*, p. 51.
6. Strachey, *op. cit.*, p. 70.
7. Quoted in Bushnell, *Native Villages . . ., op. cit.*, p. 25.
8. Verrazzano, *op. cit.*, p. 9.
9. Dankaerts, *op. cit.*, p. 55.

10. Gookin, *op. cit.*, p. 149.
11. Van der Donck, *op. cit.*, p. 196.
12. Quoted in Bushnell, *Native Villages, op. cit.*, p. 54.
13. Strachey, *op. cit.*, p. 70.
14. Lorant, *op. cit.*, pp. 190, 191.
15. Strachey, *op. cit.*, p. 196, Père Baird, *op. cit.*, p. 77, John Smith, *op. cit.*, p. 362, Verrazzano, *op. cit.*, p. 9, and many others note the use of woven mats for this purpose.
16. Charles Spregue Sargent, *A Manual of Trees of North America* (New York, 1922), pp. 3, 55.
17. Champlain, Verrazzano, Williams, Higginson, Rasles, Gookin, Hopkins, Lahontan, Smith, Spelman, Van der Donck.
18. Strachey, *op. cit.*, p. 70; Père Baird, *op. cit.*, p. 77.
19. *Mourt's Relation*, pp. 422–423.
20. The scenes on this map, engraved by William Hole before 1632, were inspired by the de Bry engravings. See Ben C. McCary, *John Smith's Map of Virginia* (Williamsburg, Va., 1957), p. 8.
21. Van der Donck, *op. cit.*, p. 196.
22. Colonel Norwood, *A Voyage to Virginia*, in *Force's Tracts* (New York, 1947), III, 35.
23. George Francis Dow, *Everyday Life in the Massachusetts Bay Colony* (Boston, 1935), p. 16.
24. Bushnell, *Native Villages . . . ., op. cit.*, Pl. 2.
25. David I. Bushnell, Jr., *Villages of the Algonquin, Siouan, and Caddoan Tribes West of the Mississippi.* Bureau of American Ethnology *Bulletin* 77 (Washington, D. C. 1922), Pls. 19, 32.
26. Norwood, *op. cit.*, p. 35.
27. Dow, *op. cit.*, p. 19.
28. Van der Donck, *op. cit.*, p. 196.
29. Strachey, *op. cit.*, p. 76.
30. Williams, *op. cit.*, p. 51.
31. Strachey, *op. cit.*, p. 76.
32. Dow, *op. cit.*, p. 18.
33. Dow, *op. cit.*, p. 259, gives the price of wheat in Boston in 1660, and on page 243 the value of a good man's hat in 1651.

BOOKS

PAUL F. NORTON, *Editor*

University of Massachusetts

HUGH PLOMMER, *Simpson's History of Architectural Development, Vol. I, Ancient and Classical Architecture* (New York: Longmans, Green and Co., 1956), 384 pp., 24 plates, 121 figs. $6.75.

This is Volume I of the new edition of *Simpson's History of Architectural Development* and includes ancient and classical architecture (Vol. II was reviewed in the previous issue. Ed.). The author was formerly lecturer and librarian for the School of Architecture of Leeds University, England.

Teachers of architectural history have been looking for a textbook or a series of textbooks that could be used by their students. Although this series looks as if it might well satisfy the requirements, Volume I unfortunately does not quite live up to the expectations.

The book is divided into three parts: the architecture before Greece, the architecture of Greece, and the architecture after Greece. One is struck by a major deficiency in the book almost immediately—the lack of drawings and the poor quality of the drawings that do exist. It becomes a test of skill to visualize the building from the detailed and sometimes confused descriptions. Unfortunately, too often the author refers us to a scarce volume or to one of the lesser-known journals not easy to obtain.

The Egyptian part is well assembled and does Clark and Engelbach full credit, and here the drawings are quite adequate. The descriptions in connection with Egyptian housing are reasonably good; at least one plan on page 42 is of help. His description of some of the building techniques at the end of the section are useful.

In Chapter 3 the author starts the discussion of architecture outside of Egypt by taking up the architecture of Sumer, again with a wealth of references and some drawings. Here he was able to secure standard drawings. These are well-placed in the text, such as the reed wall (Fig. 27, p. 62) and the courtyard of a private house at Ur (p. 63). He ends the section with a wild expression of opinion, "Indeed the Sumerians invented all that repertory of constructional forms used in our own building trade until the present century." That, I am afraid, is a bit far-fetched. He goes on to discuss the architecture of Assyria and Later Babylonia but does not seem to be too impressed. He says, in fact, at the top of page 69, "For the most part, the Assyrian was asleep." He seems to think it is the architecture of a disintegrating civilization. On the other hand, he includes a very fine survey of ancient mathematics.

The author then takes up the Bronze Age in the Aegean, and he does a fair job on Crete. He has an interesting discussion on the sources of the Doric column and some very interesting pictures of its prototypes. Other pre-Hellenic styles are discussed, such as the Hittite, and for this particular section of the book the drawings are better than usual.

In Part II he takes up ancient Greece and gives a very good introductory summary of Greek history. He discusses the condition of life, types of buildings, and the materials available. The explanation of the economics of the public structures and his treatment of Greek religion are adequate. However, when he gets into the Greek section there is a footnote to William B. Dinsmoor's book at the bottom of almost every page, and one wonders why we must read this work if Dinsmoor has already covered the ground.

In Chapter 5 he discusses the Greek Orders, and makes a reasonably clear picture of the problems. He goes on from there to the Doric temple and shows one of his better sketches on page 129 to explain the various parts of the temple. Standard illustrations are found in the chapter on architectural development; some are small, but they are all there for reference. His few remarks on city planning, unfortunately are too brief, but he does a very good job on the Greek theatre, stressing its connection with the drama itself.

Next the author begins a brief discussion of the architecture of ancient Persia—the Achaemenid Period. There are good sketches from standard texts, but others, such as the one on page 219, leave much to be desired. He also refers briefly to other contemporary styles in Asia Minor.

He starts the architecture after Greece with some general history of the period. When he reaches the Hellenistic age, most of his references are to Robertson, and here again it might be better if we read that book. With his discussion of Roman architecture he gives us a very good summary of Roman history and includes some material on Roman building methods. I have a feeling that perhaps he, as he said of one of his associates, is operating here in a field with which he is not too familiar, particularly when he suggests on page 288 that, "even the enormous bays of some Italian Gothic cathedrals are best explained by the prompting of the old Roman spirit." He has a few good drawings of building details, fortunately from Choisy, so we have the benefit of sound reference material.

In the rest of the book he covers the Roman Orders, compares them with the Greek, discusses the use of the Order on the Colosseum, and finally in Chapter 9 gets into the buildings in the High Empire, discusses them in relation to the city planning of the period, and does very well by the great fora. He treats the greatest building of all, the Pantheon, with all due respect. His discussion of baths is adequate. This is also true of the discussion of places of amusement, but here I think he could have used a few more good illustrations. His treatment of domestic buildings is much too brief, and better material is available, as he indicates by his reference.

Finally, one wonders why the publisher who has issued many famous textbooks, did not have this volume properly edited or reviewed by professionals before it was put into print. It might be the basis for a good textbook, but I hardly think this volume is ready for our classrooms.

A. HENRY DETWEILER
Cornell University

Samuel and Narcissa Chamberlain, *Southern Interiors of Charleston, South Carolina* (New York: Hastings House, 1956), 172 pp., 314 photos. $15.00; Dorothy and Richard Pratt, *A Guide to Early American Homes—North*, 252 pp., illus., and *A Guide to Early American Homes—South*, 229 pp., illus. (New York: McGraw-Hill, 1956). $6.95 each volume.

The first of these three books, on old Charlestonian interiors, is by the noted photographer, Samuel Chamberlain, and his wife. The one wandered about this Carolinian city with an "observant" camera, the other, with an "ever-present" notebook, and the result of their efforts is a large and handsome volume, "primarily a book of pictures."

The authors well realized that the bibliography of Charleston is voluminous and why write another work on the subject? But when they found lacking an adequate treatment "depicting Southern interiors as they exist" there and in the surrounding Carolina low country, they saw fit to fill the gap with this beautiful work.

Commencing with a foreword describing briefly the history of the city from its founding shortly after 1669 under a grant from Charles II, and continuing on with a discussion of the architectural styles which flourished there, the authors have wisely arranged the photographic material of the main text, not chronologically, not "in order of elegance," but by neighborhoods or localities.

Photographically, the book commences with eight full-page views before the table of contents, as if to whet your appetite for the main dish. Then the first four chapters are about walks along "four of Charleston's most gracious streets, Meeting, Church, Legare, and Tradd, with occasional side excursions." After a full-page view down Meeting Street—and Chamberlain is a master at obtaining the furthest reaches of a perspective like this one—we contemplate the Branford-Horry House, by means of a small view of the double-porticoed exterior and of several half-page shots of the interior, as well as a full-page close-up of an "impeccable" Georgian mantel with its pulvinated frieze and Dutch faïence tiles. The main text and captions, while sometimes insufficient, take an interest in antiques. For the lover of old furniture and glass this book is a gold mine.

Most of the homes illustrated are dated, the Branford-Horry House being somewhat quaintly designated as "built in about 1751."

The authors call attention to the fact that although there are "superb" examples of the Georgian in this city, it was in the Federal period that the influence of the Adam brothers became strong there —a situation owing mostly to Gabriel Manigault, amateur architect. It was the refined and exquisite Adam detail which made the greatest sweep in Charlestonian parlors, dining rooms, and ballrooms—so much so that, according to the Chamberlains, the old town was in danger of being swamped with nymphs, swags, and *putti*.

Sometimes a whole residence, like the Simmons-Edwards House, "built in about 1800," was of Adam design, and the stuccoed ceiling and mantelpiece of the dining room are "as unerringly elegant as the detail of the rest of the house." But the most "perfectly harmonious" Adam specimen in the city is the great ballroom, done in the grand manner, on the second floor of the William Gibbes House—"a breath-taking sight."

Towards the end of the big volume the authors take us to the hinterland to have a look at the neighboring plantations. The first of these is Medway, known as "probably" the oldest house in South Carolina. Although the famed crow-stepped gables of this pile built by a Dutchman are duly noted in the text, the full-page view of the domicile has its unique gable-end completely hidden by live oaks and Spanish moss. But then, this is a book about fine interiors. When we come to Mulberry, it is mentioned that the four corner pavilions have quaint "roof lines of Jacobean inspiration," a description not accurate enough for the purist, who believes the roofs are true Jacobean.

We conclude with Drayton on the Ashley River, with an especially good interior shot of the tall-ceiled drawing room, demonstrating "on what an ambitious scale John Drayton planned his house." The authors then go on to state that this mansion is "very probably the finest untouched example of Georgian architecture in America." One gets a little tired of hearing that this is the "finest," or that is the "best." Sometimes it is Westover which is the finest Georgian example in America. Another time it is the Hammond-Harwood House in Annapolis which is the best example of Georgian in the country. And now, this very day, according to the *Baltimore Sunpapers*, it is the Brice House, also in Annapolis, which is "Colonial America's finest house."

In such a superb gallery of over three hundred photographs one wonders what happened to that of the Sommers drawing room on page 89 with its blurred mantelpiece details. Nonetheless, that is a minute criticism of a splendid book which should be in every library and on the table of every decorator, architect, and collector.

While the beautiful work by the Chamberlains has some pretense of technical accuracy, Dorothy and Richard Pratt's two *Guides* to early American homes in the North and in the South join that vast literature of popular, loosely-written works on *Americana*, where frequently to be charming, witty, and vague is the excuse for lack of detailed knowledge of history and architecture. For twenty years Richard Pratt has served as architectural editor of a popular periodical, the *Ladies' Home Journal*. He and his wife Dorothy have already collaborated on the two volumes of *A Treasury of Early American Homes*, comprising albums of color reproductions. In the two new *Guides* the authors have included an outline of their own biographies.

For sheer hard work the *Guides* represent a goodly feat: 850 historic homes are claimed to be in the work on the South, and 950 in the volume on the North. Perhaps the chief value is that the books give the reader "full information on the historic museum houses and villages—how to get there, days and hours of admission, entrance fees, outstanding features, and so on." Furthermore, they list the "many private homes which you may visit by unprecedented invitation." Thanks to the authors' "discriminating appraisal of each house," the two *Guides* form "an enduring reference" work. In fact, "owning" each "book is a mark of discriminating taste."

But for the scholar and those who want to know the truth about certain historic homes, the works have frequently untrustworthy information as far as history and architecture are concerned. It very much appears as if the writers relied heavily on garden pilgrimage tour books. Such garden tour books are notoriously inaccurate, being based largely on write-ups by the home owners themselves, who are usually good at hearsay and legend and ghost stories, and who are not too careful about construction dates.

As we peruse the *Guides* and their great number of photographs, frequent examples of flattery, sentiment, and naïveté are found, of which a few representative ones from the volume on the South are here listed: "Its owners are as distinguished as their dwelling" (p. 47); "It is reverently occupied" (p. 14); "One of the greatest of the great colonial mansions in America, . . ." (p. 14); "for here you come face to face with perfectionism" (p. 15); "Its portico cries out for the camera" (p. 89).

In such a monumental undertaking as the *Guides*, it is almost impossible to avoid errors. A few are cited: "Rosswell" in Georgia should be "Roswell." The word "dependency" (p. 15) appears not to be used in its correct meaning, but as a synonym for outhouse—any outhouse. The "Kinsey John House" in Newcastle should be Kensey Johns House. Can German work, as in the Hager House in Hagerstown be "Jacobean," when "Jacobean" is exclusively an English architectural style?

As for the dates in the book, the authors state: "As a rule we have let any convincing and commonly accepted date stand as a useful approximation of the house's age." Consequently there is found in the *Guides* the outworn cliché that the "Rolfe House" in Virginia, the true name of which is "Smith's Fort Plantation," was erected in "1652."

In a work of this size it has not been easy to vary the descriptions of nearly two thousand houses, and there the authors have done a good job. Nevertheless, the *Guides* are "popular" writings in every sense of the word and should prove handy to those who visit about and need to gain admission. Especially interesting and creditable are some of the brief résumés at the beginning of each chapter (comprising a state) and of the localities, such as "On & off Beacon Hill."

Perhaps the most delightful expression to be met with in the two

volumes was found in Georgia: "The wolf of progress." Preservationists from all over the country are vitally concerned with what this "wolf" is doing to our historic architecture. And the Pratts are in the van of this great movement for preservation in a wilderness of destruction.

HENRY CHANDLEE FORMAN

Henry Chandlee Forman, *Tidewater Maryland Architecture and Gardens* (New York: Architectural Book Pub. Corp., 1957), 208 pp., illus. $10.00.

Tidewater Maryland Architecture and Gardens is the second part of a planned three-volume work by the author on this subject. It is a sequel to the author's *Plantation Houses of Maryland*, issued in 1934. Volume III is noted as to be on Maryland wattles and half-timber work. The author in his introduction to the present book tells us it "is intended to be a series of concise monographs of Maryland gardens and buildings, classified regionally for the purpose of making a record, and of showing the beauty of a time and place which has changed."

There are thirty-two essays under four geographical headings, The Lower Eastern Shore, The Upper Eastern Shore, Southern Maryland, and Upper Bay Counties and Baltimore. They vary in length from three-quarters of a page to ten or more pages. It is generously illustrated with the author's measured drawings and sketches, and photographs. Many of the latter are of buildings now gone or changed. A large number of the drawings are of buildings which the author has reconstructed from his own ground studies and measurements. Included among these is the imposing St. Mary's City Castle of 1639, the foundation of which the author explored in 1940 under a research grant from The American Council of Learned Societies.

The book is attractively printed with good format and illustrations. It is a public service, revealing a great deal of personal research and diligence, and a great deal of personal pride in the achievement. In his introduction the author says: "How many afternoons and evenings we have returned home exhausted . . ." and "It will be said *he* was a historian, *he* recorded and interpreted the past . . . [when] . . . that he held for years top rank in American colleges teaching fine arts and archeology, will not be remembered."

The author continues with forthright satisfaction, "Of the six architectural styles which prevailed in early Maryland the writer has since 1934 discovered, identified and named five of them. The Georgian style was previously known." The six are of interest: 1. *American Indian* architecture, "although outside the scope of this study"; 2. *Medieval style*, "part and parcel of the Medieval style of Great Brittain"; 3. *Jacobean* style, "in Maryland a minor expression and dominated by the Medieval style"; 4. *Transitional style*, "more complicated—overlaps both 17th and 18th centuries"; 5. *Georgian style*, "prevalent in Maryland from 1720 to around 1790, and came from England along with china, tea, and good manners"; 6. *Hangover*, which might be anything up to 1850 with *Hangover Medieval, Hangover Traditional* and *Hangover Georgian*. What a convenient category! The latter he considers as "part of the great Federal or Early Republican style of architecture. . . ." "There is no such thing in architecture of Tidewater Maryland as the Colonial style or the Colonial type. . . . The period is a Myth—."

One regrets the introduction of extraneous additions as the one after "the slave or servants building—usually of the most primitive sort" (p. xii), "yet far better than the circular round wooden huts in central Africa from which the negroes came." Equatorial African houses were well adapted to their needs. Or again, the illustrations of the interior paneling of Genesar (p. 32) are labeled, "Secretly stolen and loaded into a truck at night." The illustration of the guest room of the Fasset House (p. 46) includes in its label "where this writer was forbidden in 1932 to enter." There are other personal irrelevancies which detract from the scholarly value of the work.

This reviewer makes the above quotations with some genuine concern as the author closes his introduction with the stern warning that "No one may in any fashion or manner copy, borrow, or use the material in this book without written permission from the author and the publisher."

JOHN DAVIS HATCH, JR.
Norfolk Museum

Carroll L. V. Meeks, *The Railroad Station* (New Haven: Yale University Press, 1956), 203 pp., 231 illus., 5 figs. $7.50.

In *The Railroad Station*, Carroll Meeks has given us an excellent study which adds greatly to our knowledge and understanding of the development of architecture during the nineteenth and early twentieth centuries.

The organization and interpretation of the architectural evolution of a particular chronological period is a formidable task which must enlist the efforts of many scholars. From myriads of buildings of all types constructed within the period, an array of examples must be retrieved sufficient in number, range, and detail to ensure representative samples of the fabulous diversity of inheritance, milieu, thought, and action which is inherent in a social art. Out of such a corpus emerge the facts which can be marshalled in special studies of the architecture of geographical units large and small, the oeuvre of individual designers, and typical solutions of constructional, functional, and compositional problems. If such analyses are soundly executed, they can lead in turn to general hypotheses of over-all trends and ultimately to valid interpretations which "explain" the sources, formation, evolution, and final transformation of architectural practice and thought of the period under consideration.

Nevertheless, as every competent historian knows, the formulation of history does not, and cannot, operate so methodically. There is a healthy interplay between all stages of the operation. No corpus can be complete or representative until it includes the accidental discoveries of scholars seeking to test their hypotheses. The inevitable accidents of survival distort the record and require the scholar to exercise imagination and judgment in their correction. It is, indeed, this quality of enthralling exploration which stimulates the historian of a creative art such as architecture.

In the light of these difficulties, it is not surprising that the history of architecture is only now approaching the threshold of credible synthesis. It is difficult to remember that only a generation ago the architecture of ancient Mesopotamia was just being recovered and that of Egypt still sprang full-blown from a vacuum. Greek architecture, despite a century and a half of study, ended with Alexander; even today the Hellenistic period remains a tantalizing gap. Only a handful of Roman buildings outside the Imperial City were known. The Byzantine and early medieval story was a bare and garbled outline. The Romanesque awaited the rediscovery of its lost masterpiece, Cluny III. The Gothic was still interpreted in the mechanistic terms of Viollet-le-Duc. The later sixteenth century floated aimlessly in a miasma called the "Post-Renaissance." And Frothingham refused to face the task of carrying Sturgis' volumes beyond 1600 because since then nothing significant had occurred. Through the effort of countless scholars, our corpus for these periods has now vastly expanded, convincing restorations have given us surer footings, and we are beginning to recognize whole networks of exciting trends.

The early chroniclers of the nineteenth century faced a different set of problems arising in the bewildering profusion of materials and trends. The first to attempt synthesis were content to describe the comings and goings of one or more stylistic revivals in one or another country. Occasionally an outstanding architect inspired a eulogistic biography. The development of new building types and structural systems, if attempted at all, was relegated to introductory chapters of practical handbooks written by practitioners impatient to expound current techniques. In such a chaotic situation, interpretation gave way to misunderstanding and callow mockery. Slowly during the past three decades, a growing company of scholars has worked to redress this imbalance. Gradually, the record of the nineteenth century's accomplishment is being established in sufficient detail to reveal its real intention and meaning. And, as so often happens, the truth is much more striking than the fiction provided by yesterday's romantic critics.

The importance of *The Railroad Station* is that Mr. Meeks has assembled, described, analyzed, and lucidly interpreted the evolution

of one of the most characteristic building types of the century between 1830–1930. He marshals a wealth of examples into five well-organized chapters devoted to critical periods—Functional Pioneering, 1830–1845; Standardization, the 1850's; Sophistication, 1860–1890; Megalomania, 1890–1914; and the Twentieth-Century Style after World War I. Each of these chapters traces in Europe and the United States the development of functional requirements, typical solutions of plan and construction, and the changing modes of aesthetic expression.

It was Henry Adams who compared the railroad fever of the nineteenth century with the passion of the twelfth and thirteenth for cathedral building. Mr. Meeks recaptures for us much of the mid-Victorian enthusiasm for the new institution which applied a burgeoning technology to the realization of an age-old dream of speed, relaxed the provincialism of the hinterland, stimulated increasing urban concentration, and fulfilled the compelling desire for national unity by the physical bonds of its iron rails.

Despite static masonry and metal, the railroad station was the architectural expression of this dynamic institution. Mr. Meeks exploits fully the psychological values of these buildings as the new gateways to the cities, as monumental reassurances for timid travellers, and as exuberant propaganda enthusiastically undertaken by competitive corporations. Though there are many other facets to nineteenth-century life and though one must study the evolution of many other building types in order to understand completely the complex character of the age, Mr. Meeks amply justifies the railroad station as a remarkably telling and representative symbol.

Many students of nineteenth-century architecture have recognized that growing technical mastery gave its planning and constructive phases continuity and unity. On the other hand, its welter of stylistic allegiances has made more difficult the discovery of a coherent aesthetic pattern. Mr. Meeks proposes a resolution of this stylistic heterogeneity by designating its major spirit as *picturesque eclecticism*. He analyzes this concept in Chapter One, which, though it prepares the reader for his use of railroad stations as typical manifestations of the proposed style cycle, must constitute a somewhat forbidding introduction for all except serious scholars. It is, however, well worth the effort because it attacks a long-neglected and pressing problem.

In the term, *picturesque eclecticism*, Mr. Meeks has combined two fundamental criteria. In the first, *picturesque*, he sees nineteenth-century vision as fulfilling the pictorial doctrines of Uvedale Price. Mr. Meeks defines the special characteristics of the *picturesque* as applied to architecture to be: variety, movement, irregularity, intricacy, and roughness. The second criterion is *eclecticism* which to him exhibits three evolutionary phases: 1790–1860, *symbolic;* 1860–90, *synthetic;* and 1890–1914, *creative*. He gathers a wide-ranging body of nineteenth-century criticism to support his analysis.

As Mr. Meeks points out, the first phase of *picturesque eclecticism* was well established by the late 1830's when the larger urban stations began to aspire to the status of monumental architecture. During the rest of the century, the station (or in Britain, the adjoining hotel) exhibited fully the complex features of the style—the broken silhouette, the landmark towers, the panoply of ornament, polychromic masonry, and ever-increasing size.

Attractive as the thesis of *picturesque eclecticism* is however, it is fair to ask whether or not it oversimplifies the analysis of the nineteenth-century taste. For the stations themselves, it might be argued that the spacious train sheds of iron and glass were pictorially dramatic in their variety of vistas and their invitation to movement, but such a modification of the meaning of these terms and the entire absence of other characteristics makes the attempt questionable. Perhaps it is better to acknowledge that the proposed characteristics of *picturesque eclecticism* are conceived primarily with regard to the composition of the exteriors of buildings. Nevertheless, if we are to look beneath the surface ornamentation to the essential quality of a design, it is difficult to see *picturesque eclecticism* in such buildings as Barry's Reform Club, Smirke's British Museum, Walter's Girard College, Fowler's Hungerford Market, or Paxton's Crystal Palace, without destroying its value as a meaningful category. It seems safer to acknowledge the concurrence of both dominant and antithetical styles. Despite this caveat, Mr. Meeks deserves the gratitude of us all in proposing so persuasively a very useful concept around which to organize the discussion of nineteenth-century composition.

One of the most interesting aspects of the evolution of the railroad station was its rapid rise to a position of symbolic eminence. Mr. Meeks recognizes the role of corporate exuberance and competition which up to World War I produced an ever-increasing number of monumental examples. Since the emergence of the corporate client is one of the fundamental factors in modern architectural practice, one wishes that a more extended consideration of the railroad company as client might have been possible. It seems likely that such companies may well have been the first corporate clients. Industrial building throughout the period was still dominated by individual owners. In the case of the railroads, it would be interesting to discover, for example, how much of the obvious penchant for display depended on the ascendancy of some one individual officer or director who sought in the station a personal, though sublimated, monument, as Commodore Vanderbilt certainly did in the first Grand Central Terminal. Such a study might indeed reveal whether the ultimate control of a board or even a group of stockholders imposed the eventual surrender to the unimaginative criterion of dividends which was reflected first in the abandonment of the train shed and, more recently, the hucksterish encroachments which have so mutilated the fine concourses of the Pennsylvania and Grand Central termini in New York. Indeed, it seems likely that the present economic plight of the roads may be due not so much to the competition of plane and automobile as to a stupid dissipation of public appeal. The story of the railroad station in recent years, like that of the roads themselves, exhales an aroma of despair. It is for this reason that Mr. Meeks' account inevitably ends on a note of inexorable Greek tragedy.

Although Mr. Meeks notes about 1914 "exaggerated efforts to analyze stations statistically," it would have been worthwhile to discuss in detail the significance of the study of 64 stations conducted at that time by the American Society of Railway Engineers. The point of view in this analysis—that facilities should be logically related to the volume of use—was first evolved in precise physical terms in the planning of factories. The ASRE report, published just after the war, was a reasonable extension to a similar functional problem and encouraged like analyses of other types. Mrs. Lillian Gilbreth's extraordinary time-motion studies of domestic kitchens were the ultimate consequence. This concern for physical efficiency gave architects a new technique by which to gauge their plans, and this, in turn, led to the expansion of the concept of efficiency to include economic factors. Finally, however, a renewed realization of the necessity of humane amenities was rationalized as "human efficiency." The cycle dramatically symbolized the general trend in the theory of contemporary design.

As evidence of conscientious perusal, this reviewer can cite only three miniscule inaccuracies. Though dimensions depend upon the selection of the points to be measured, the 153-foot span of the Liverpool train shed of 1850 did not yet reach a world record. That honor was still held by the timber trusses of the Darmstadt Riding Hall, built by Schubknecht in 1784 over a span of 155½ feet. The clear span of the Galerie des Machines of the 1889 Paris Exposition is usually reported as 115 meters (377 feet) and that of the Columbian Exposition's Machinery Hall as 368 feet, instead of the dimensions given in *Table 3* (page 115).

In summary, Mr. Meeks has produced a monograph which is not only based on a comprehensive inventory and meticulous documentation—he concludes with an excellent *Bibliographical Essay*—but which is also a pleasure to read. The Yale University Press is likewise to be commended for giving the volume an attractive format. The plates are clearly reproduced, a virtue that seems increasingly to be a Swiss monopoly. It is to be hoped that the success of *The Railroad Station* will stimulate similar studies of nineteenth-century building types which, together with detailed analyses of constructional and aesthetic trends, will at last support a real synthesis clarifying that fascinating labyrinth which is nineteenth-century architecture.

TURPIN C. BANNISTER
University of Florida

Grant C. Manson, *Frank Lloyd Wright to 1910: the First Golden Age* (New York: Reinhold Pub. Corp., 1957), 227 pp., 135 figs., 259 illus. $10.00.

The unity and comprehensiveness of this book make it a welcome addition to the many publications which for more than a generation have been paying tribute increasingly—although belatedly—to America's greatest architect. This is the first of a three-volume project which will cover the life and works of Frank Lloyd Wright up to the present—or future.

Dean Manson writes with an infectious enthusiasm and considerable literary grace—despite such Gallic affectations as "parti," "oeuvre" and "precis" which must irk the man who invented "carport" to avoid "garage" which smacked of the "École." The esthetic analysis of the works of Wright shows good understanding, sensitivity, perceptiveness and—to the extent that the author applies the scientific method to ferreting out the correct name, location, or date—scholarly acumen.

I wish I could say also that the author is objective in analysing and defining the constituent elements of Wright's style. Objectivity, I believe, is the prime requisite in a work of such projected magnitude which in relation to the already existing publications on Wright should aim at being definitive. Unfortunately, objectivity is obscured or lost in the brilliance of a deifying mandorla which the author has fashioned around his hero in terms of a new—or very old—mystique accompanied by such incantational expressions as "genius," "Celt," "miracles," etc.

So strong is the partisanship of the author that he begins his book with the statement: "Students of the career of Frank Lloyd Wright inevitably discover that any attempt to account for his accomplishment in customary terms of example and influence does not work. Sooner or later, they are faced with the fact that it is essentially spontaneous." A few sentences further he tells us that the architecture of "his first maturity is so radical and so personal that it can only be explained as coming from within."

In view of the inclusion in his bibliography of publications which disprove such contentions, I do not know whether the author has failed to read them or whether his attachment to his hero is so strong as to make it impossible for him to recant or modify youthful and wishful conclusions of a generation ago. This is especially disappointing when one recalls that Wright contradicts the principle upon which the quotations stand by pointing out "that the best of the present comes from the past and the future will come from the present." Furthermore the author has later on—although reluctantly and inadequately—pointed to the influence on Wright of the work of Silsbee, Sullivan, the Japanese, etc.

However each of us thinks of the greatness of Wright, he is certainly a human being and not another Athena, born at maturity and ready to create "miracles" from "within" in an Elysian vacuum which the author first affirms and then tries to negate by the meaningless explanation that Wright "did not live his life in a vacuum; on the contrary he has always been, in the broadest sense, a public figure." Indeed, he could not live in a vacuum—whether a public figure or not. Before anything could come out from "within" Wright—or any man—something had to be experienced in the environment and put "within" to be assimilated, modified, and expressed in different blends which constitute artistic, scholarly, scientific or even business production.

What distinguishes Wright—and other great architects—from the great mass of their mediocre colleagues is not that he was born or prenatally conditioned to become a great architect, but that he was born with a good measure of intelligence and iron will and the potentials of good taste, all of which were first developed in his early environment by his custodians and later used consciously or unconsciously by Wright to find, consume, and assimilate from a wider horizon—in all senses of the word—than that of his contemporary Americans, what the universal environment could offer him: nature, Froebelian toys, and all the world's inheritance of the past and present. He exercised constantly his faculties and escaped the inertia which traps most human beings in ruts of imitation or repetitiousness. Wright found here, there and everywhere, and took—or in the paraphrased words of T. S. Eliot, "like a great poet, he did not 'borrow,' but 'stole' and made his own"—forms and principles which he blended and reshaped into buildings, which seem original or spontaneous to those who do not know the architecture of the world or who refuse to see the available evidence.

Explaining Wright's achievement as "spontaneous," the work of "genius," as "miracles" issuing from "within," is to identify his creativity with Plato's theory that an artist is an unconscious madman through whom providence speaks, and to deny the architect that conscious process of creation by which he was able to do so much more than his contemporaries out of the same material which was available to all. With a more human interpretation of Wright, one can understand and forgive some of his bad or mediocre buildings, some leaky roofs, some dark houses, some of his Procrustean furniture, etc., and would not explain them by such pompous or mystical explanation as a "temporary deflection in the course of his genius."

The book suffers also from what seem to be survivals of the author's youthful infatuation with Wright. The near-vacuum in which he sees Wright is evident not only in the author's inability to perceive other styles and principles that played a part throughout the formation of the architect's career but also in his failure to consider the relation between Wright and the contemporary English architects, especially MacIntosh who has many things in common with Wright, whether as a result of unilateral influence or reciprocal exchange. Very little is said about the important part that some of the assistants played in the formation of Wright's career, for it is inconceivable that during Wright's prolific years these assistants were nothing more than pen-pushers and copyists. Likewise the bibliography reveals the weaknesses that we all had in our school days when the desire for a definitive bibliography or padding led us to include articles and textbooks which barely mentioned the topic of our dissertation. Even so, this bibliography is far from complete and does not include other critical articles and reviews on books or exhibitions by Wright. If the padding of the bibliography is a survival from the dissertation, the padding of the book, by means of empty spaces, is something which the designer has generously woven into a form, clearly suggesting the influence of Wright's books—but also the open spaces of the prairies. In the same spirit presumably, the references are given each time completely in the text pages and without such unesthetic—and space reducing—symbols as *"op.cit.," "loc. cit.,"* etc., not to speak of the fact that the italics of the notes are in larger type than that of the captions. If one must have some kind of inflation it would have been better to have had it in the captions by adding the dates of the buildings so that one can make rapid and convenient visual comparisons without a laborious recourse to the text. Finally the photographic illustrations themselves are frequently unsatisfactory either because the "art work" did not always consist of well-made original photographs or zinc cuts, or because the method of reproduction led to the blurring of the final images, which gave many of them a rather disagreeable soft focus. Considering the cost in relation to the potential circulation of anything concerning Wright, this is a small book for the price—despite the designer's esthetic expansion of its mass. Since the binding may be estimated as costing about two or three dollars it would seem more advantageous for the purchaser if the whole project were published in one or at most two volumes.

Conclusion for capsule readers: A well-written and perceptive appreciation of Wright's early career, but neither well-balanced nor definitive, as it should be, because it lacks objectivity.

DIMITRI TSELOS
University of Minnesota

H. F. and E. R. Withey, *Biographical Dictionary of American Architects (deceased)* (Los Angeles: New Age Publishing Co., 1956), 678 pp. $15.00.

The publication of the Withey's biographical dictionary just two years after Howard Colvin's *A Biographical Dictionary of English Architects, 1660–1840,* suggests comparison. Both cover a period of roughly two hundred years and contain a large amount of painstakingly gathered information. Inevitably they also contain hundreds of omissions and factual errors. This is not to suggest that the compilers were careless editors, but rather that their sources were fre-

quently inadequate or incorrect. These books are the first modern attempts at accuracy and completeness within the selected periods and as such are most noteworthy contributions to scholarship. But they will need to be corrected in later editions through the assistance of scholars who have made more particular studies of individual architects. An alphabetical arrangement was adopted in both volumes, though Colvin, more aware of the scholar's problems, added an index of persons (unfortunately not including cross references to architects) and an index to places. Both authors have indicated sources for their material. However, Colvin is superior here, for he has delved deeply into innumerable books and journals and has extended his searches to local church and building archives. On the other hand, the Witheys have relied heavily on the *Dictionary of American Biography*, newspaper obituaries, and a few selected journals and books. In fact, their limited use of available sources weakens their work. The results obtained by consulting many more periodicals and newspapers would have been well worth the time and effort. I have not discovered, for example, a single reference to an article in the JOURNAL OF THE SOCIETY OF ARCHITECTURAL HISTORIANS. Full use of the *Art Index* would have supplied better and more recent references.

Of the two, Colvin's work is certainly more thorough, though one must remember that his task in some ways was easier. English historical societies, churches and libraries are ahead of their American counterparts in collecting and cataloguing historical material.

The Witheys must be given great credit for their compilation. It is to be hoped that they will soon publish a second edition with appropriate corrections.

PAUL F. NORTON
University of Massachusetts

BOOKS RECEIVED

(Mention of a book here does not preclude its subsequent review.)

Rosamond R. Beirne & John H. Scarff, *William Buckland 1733–1774, Architect of Virginia and Maryland* (Baltimore: Maryland Historical Society, 1958). $7.50.

Theodore M. Brown, *The Work of G. Rietfeld, architect* (Utrecht: A. W. Bruna & Son, 1958).

K. A. C. Creswell, *A Short Account of Early Muslim Architecture* (Baltimore: Penguin Books, 1958). $1.95.

A useful, condensed version of the expensive two volume set published in 1932 and 1940.

Peter Kidson, *Sculpture at Chartres* (London: Alec Tiranti, 1958).

The short descriptive text, though well done, adds little to our historical knowledge of Chartres Cathedral. The illustrations are plentiful and clear.

Eugen Kusch, *Mexico in Pictures* (New York: Architectural Book Pub. Co., 1958). $12.00.

The book contains a very handsome collection of photographs, more than half of which are architectural, a short essay on religion and mythology, and descriptive notes for each plate. The volume will make a fine pictorial addition to the library of Latin American enthusiasts.

Helen Hill Miller, *George Mason of Gunston Hall* (Lorton, Va.: pub. by Board of Regents of Gunston Hall, 1958). $1.00.

Mainly a biography, but one section is devoted to the building of Gunston Hall by William Buckland, architect.

Nikolaus Pevsner, *North Somerset and Bristol: Buildings of England* Series (Baltimore: Penguin Books, 1958). $2.25.

———— ————, *South and West Somerset*. $1.95.

Eduardo Torroja, *Philosophy of Structures* (Berkeley: Univ. of California Press, 1958). $12.50.

Marcus Whiffen, *The Public Buildings of Williamsburg* (New York: Henry Holt & Co., 1958). $12.50.

PERIODICALS RECEIVED

Archivo Español de Arte, Madrid, Spain.
No. 121. Jan.–Mar., 1958.
This issue contains three articles on architecture, including one on the excavations at the Cathedral of Santiago, one on Mudéjar churches, and the third on the eighteenth-century architect Fray José Pina.

Journal of the Royal Society of Arts, London.
No. 5024, July 1958.
No. 5025, Aug. 1958.
Article by Kenneth Clark on Andrea Mantegna mentioning the origin of the artist's use of architecture in painting.
No. 5026, Sep. 1958.

Kenchiku Bunka, Tokyo. No. 142. Oct. 1958.

SAH NEWS

THE ANNUAL MEETING

The annual meeting of the Society will be held on January 29, 30 and 31, 1959, in Cleveland, Ohio. The sessions will be held jointly with those of the College Art Association. Announcements have been sent to the membership.

EDITORIAL NOTE

This issue, Winter 1958, brings to a close six very pleasant and busy years as editor of the JOURNAL. The new editor will be Paul F. Norton of the University of Massachusetts, who leaves the book review editorship to take on the new assignment. I should like to thank the men and women who have made the JOURNAL possible during these years: our readers, both gentle and ferocious; the writers and photographers who have sent in their work; my colleagues on the editorial staff; the officers and directors of the Society who have been so patient, encouraging and generous; the people in R. R. Donnelley & Sons Company (The Lakeside Press)—particularly Pierce P. Green, Ralph H. Herrold, Kenneth W. Pumroy, Robert F. Reynolds, Paul Rydell, and Albert H. Schlag. I wish to thank the governing board and the staff of the American Institute of Architects and especially my immediate family who have lived with JOURNAL deadlines and vicissitudes for six years without protest.

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